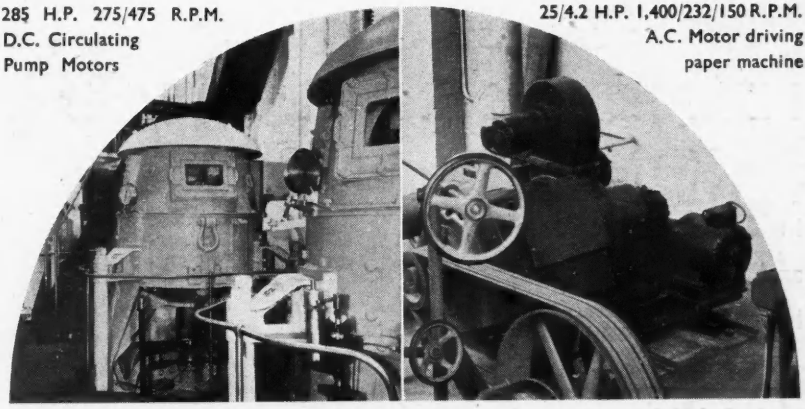
ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXI. No. 3383. SEPTEMBER 25, 1942 6d. WEEKLY

285 H.P. 275/475 R.P.M.
D.C. Circulating
Pump Motors

25/4.2 H.P. 1,400/232/150 R.P.M.
A.C. Motor driving
paper machine



VARIABLE SPEED DRIVES . A.C. and D.C.—

L.S.E. know a great deal about both

For nearly sixty years we have been making D.C. motors for variable speed drives of all kinds, including many tough wide speed range propositions.

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It is well worth while to consult us when you have a variable speed motor application.

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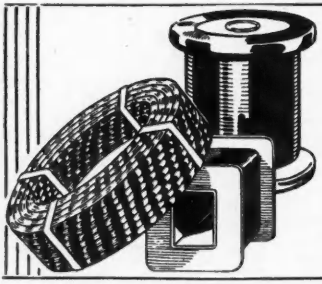

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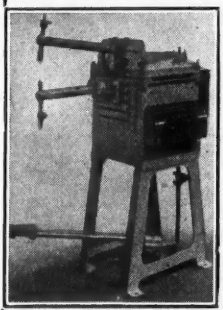
ELECTRIC WELDING MACHINES



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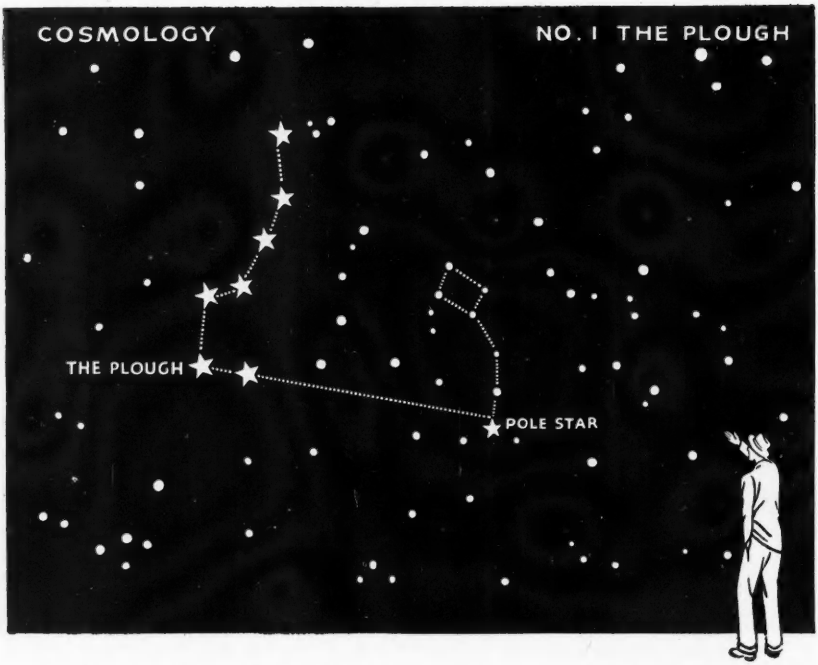

You need never lose your direction on a starry night if you learn to recognise a few of the principal "constellations" or groups of stars.

The constellation emphasised above and familiarly known as the "Plough" includes seven prominent stars, two of which act as "pointers" towards the Pole Star, which lies directly above the Earth's North Pole and is a fixed point round which the entire stellar system, including the Plough, appears to revolve slowly from East to West (once every 23 hours 56 minutes).

Although the position of the Plough, as it revolves around the Pole Star, depends on the date and time of day, you will have no difficulty in recognising it and locating the Pole Star by means of the "pointers."

THE POLE STAR LIES DUE NORTH.

COSMOS
AND
METROVICK
LAMPS
Metrovick's 'light' product
FUEL ECONOMY—
USE LESS LIGHT
BUT
USE IT *Well*
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
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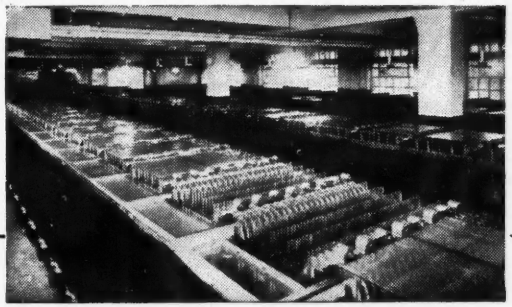

Illustration shows an installation of Alton Batteries of Merit at an important London Telephone Exchange.

A1a/41

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And now the matchless deed's achieved
Determined, dared and done.

CHRISTOPHER SMART.

There is a common tendency to admire mere size. Talented men and promising businesses are apt to be overlooked until their merits bring the success and importance which command attention. By the test of size the Alton Company would not have attracted much notice when it started. It was small, but it had a product and a policy which could not be denied success. It made batteries of the finest quality; carried out re-plating of the highest standard at the lowest rates which could show a reasonable profit; experimented with improvements and learned from experience. This policy has made the Alton Company big not only in size but in reputation, and it will continue to rely on this policy to carry it to still greater success.

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BATTERIES
THE ALTON BATTERY CO. LTD.
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Telegrams :
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A. C. 4 BEARINGS
400 VOLTS, 3 PHASE
50 CYCLES.
1, 2, 3, 4 AND 5 H.P.

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IMMEDIATELY ON RECEIPT OF MACHINE TOOL LICENCE AND CONTRACT NUMBER

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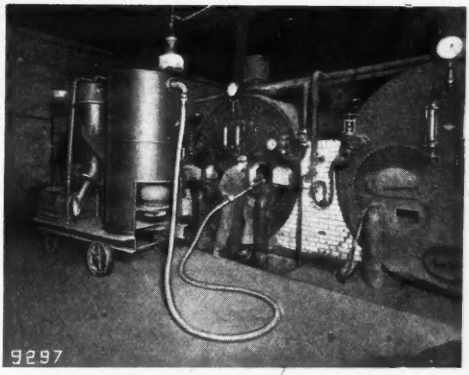

THE CLEANEST WAY TO CLEAN BOILER FLUES
EXTRACTS ALL DUST AND DIRT
REDUCES THE LABOUR INVOLVED

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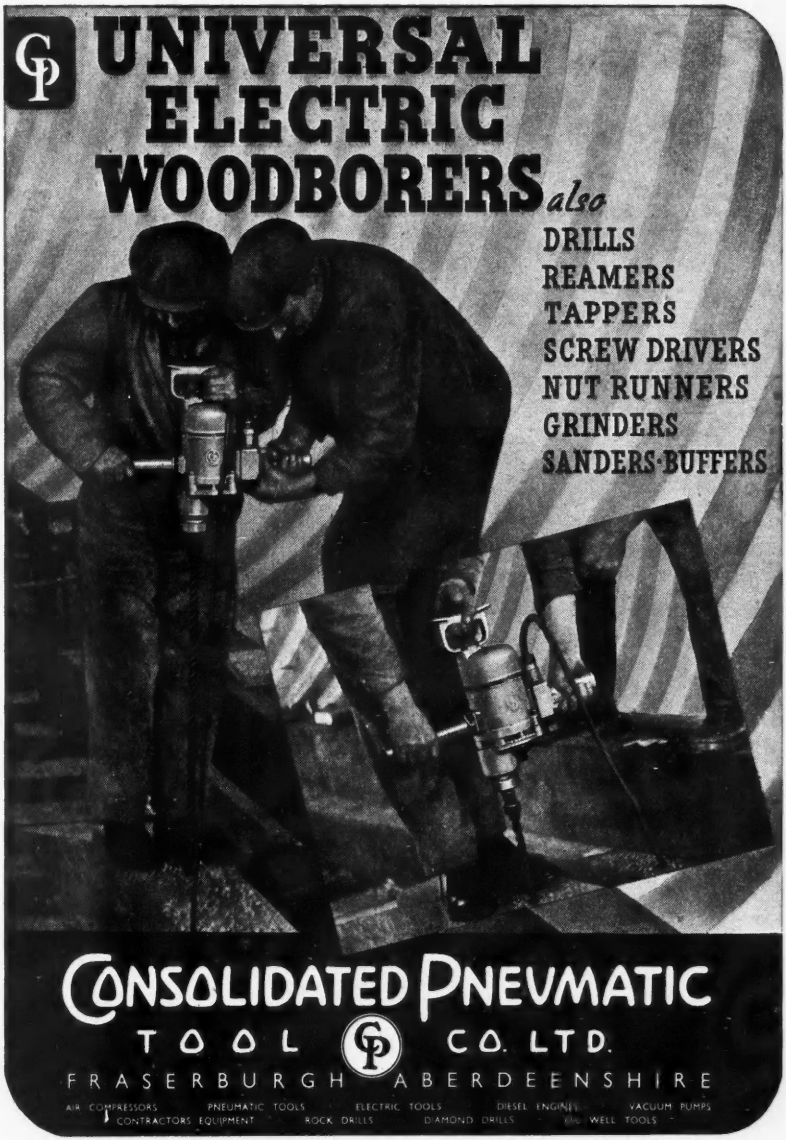
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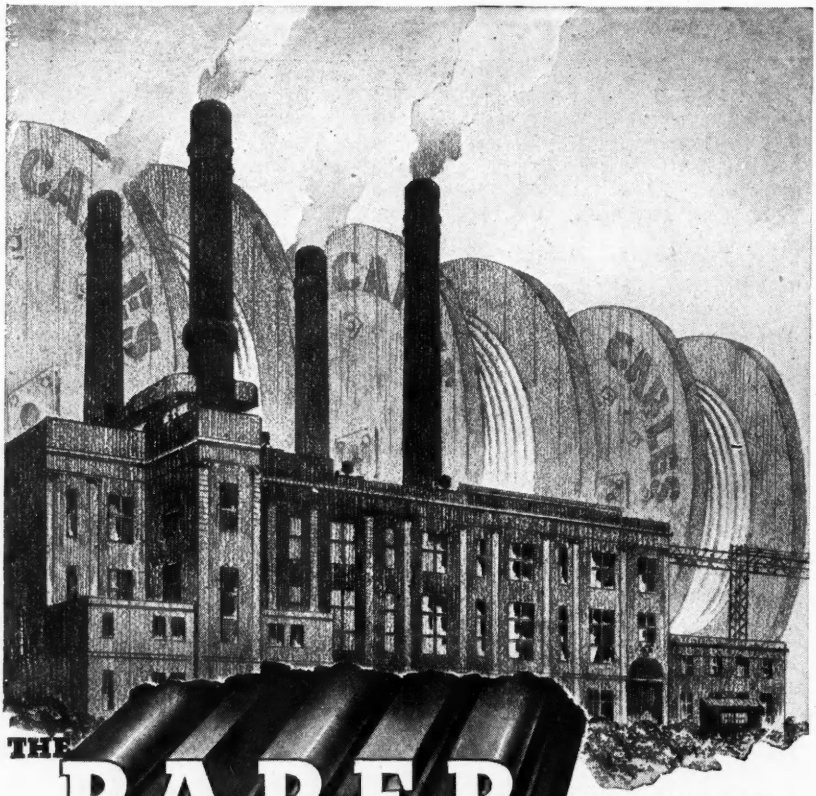

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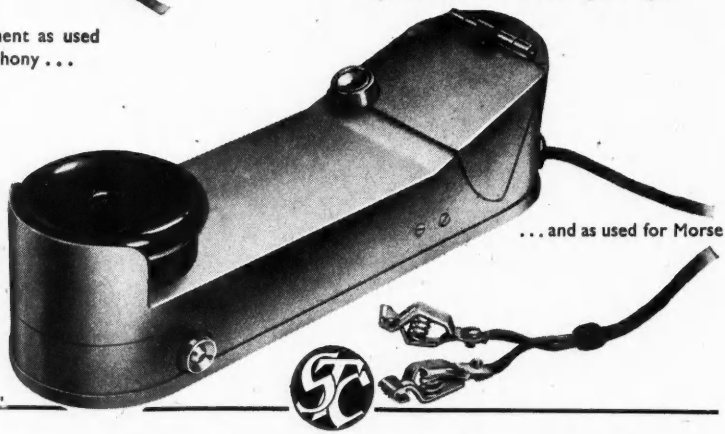

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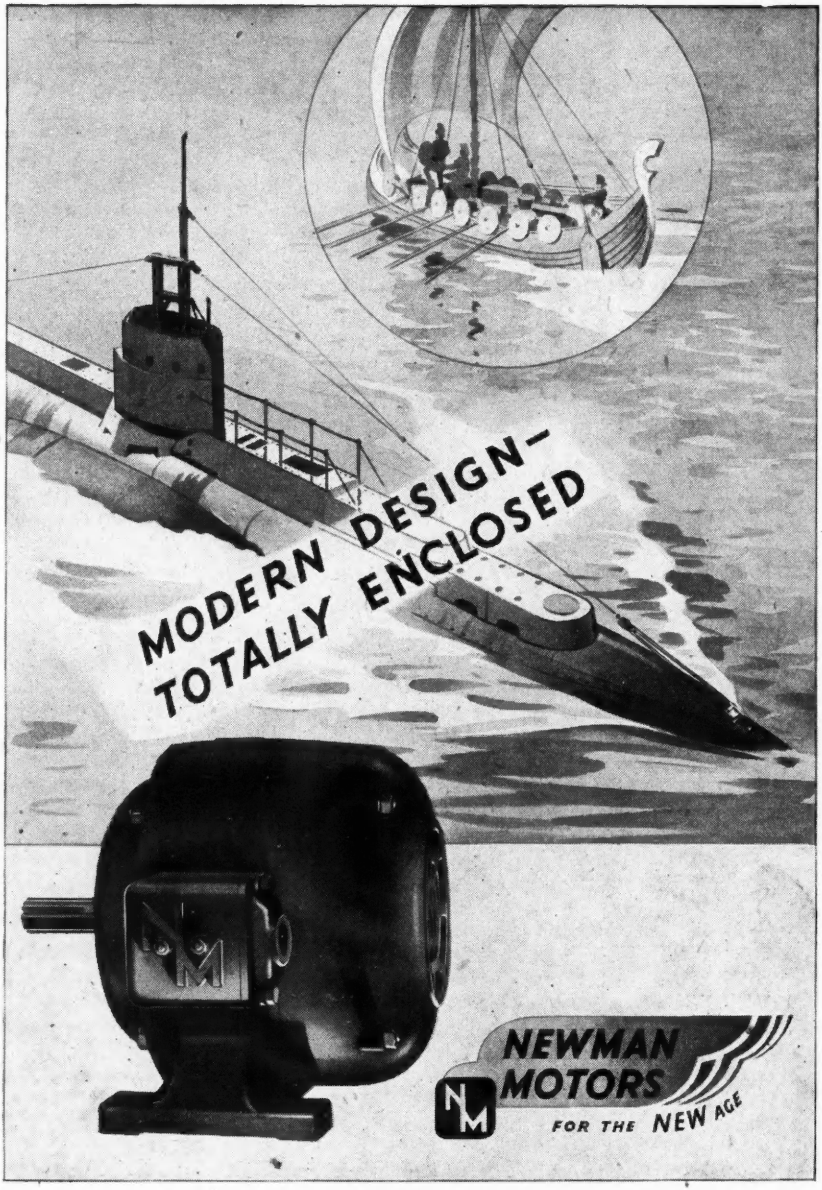

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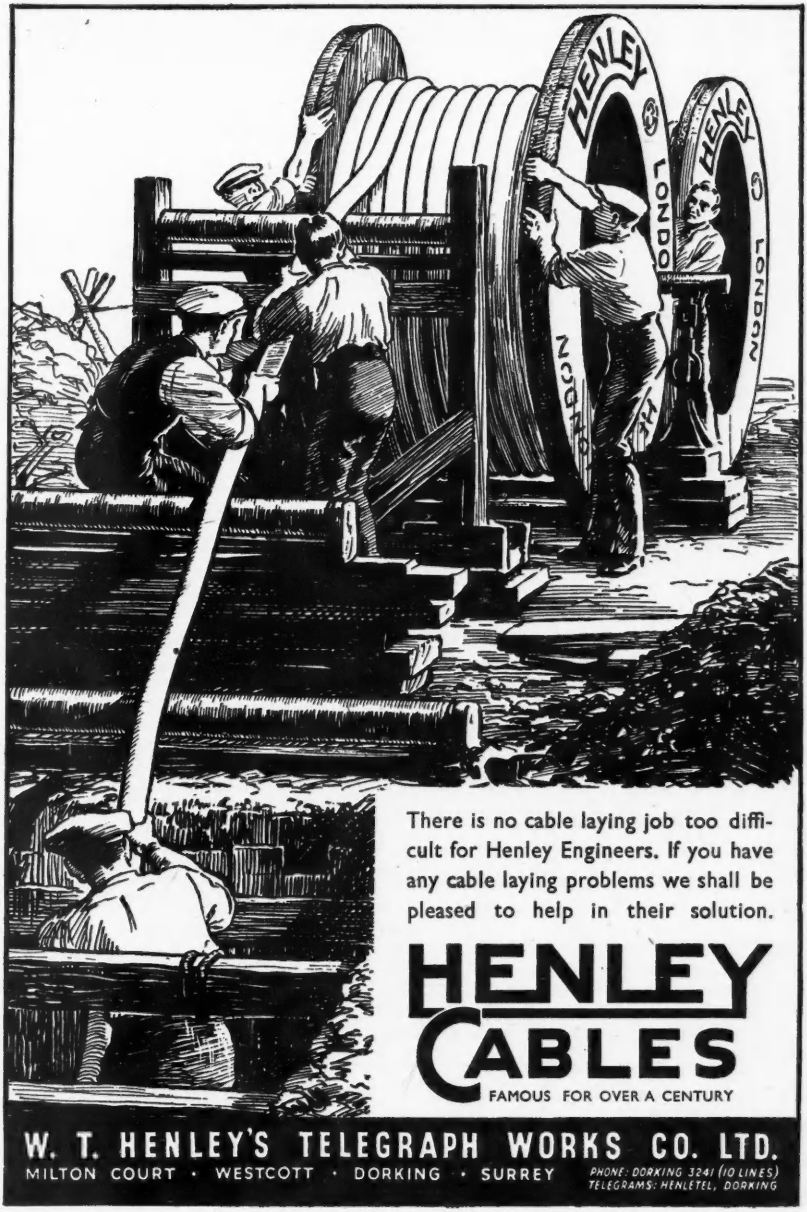

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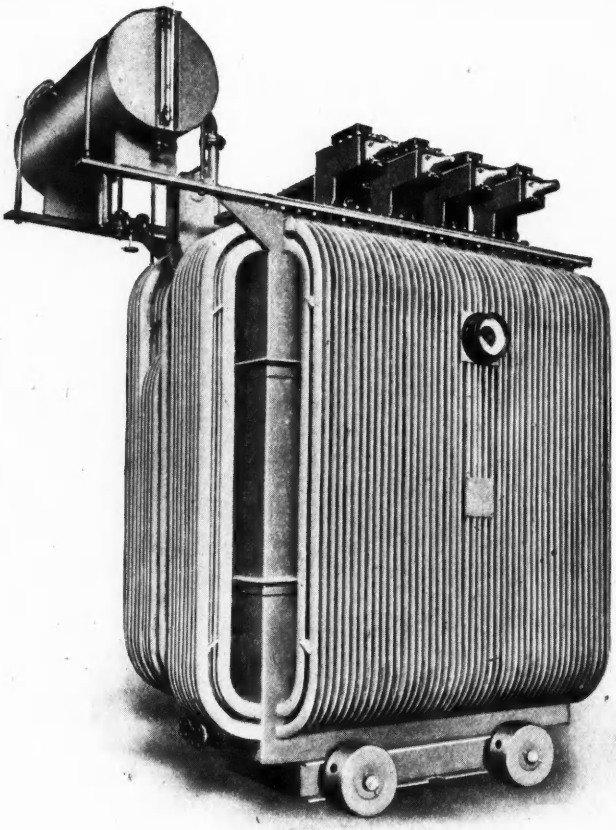
E.C.C. transformers excel in design and construction, therefore in performance.



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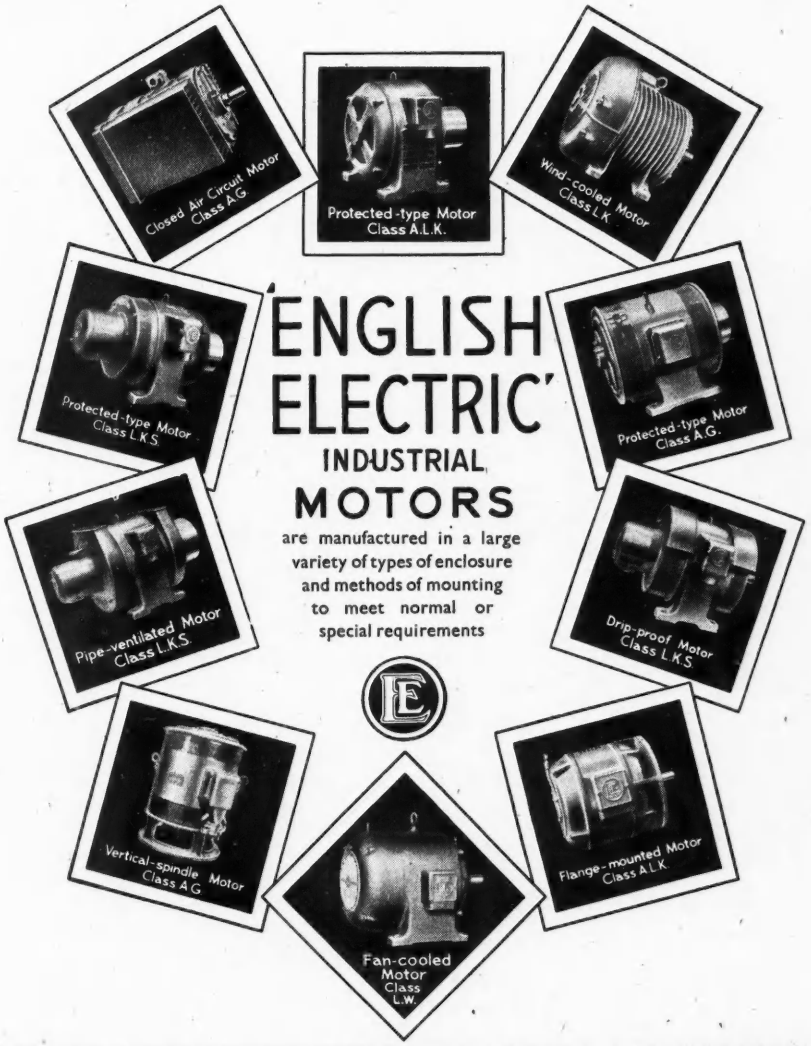
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are manufactured in a large variety of types of enclosure and methods of mounting to meet normal or special requirements

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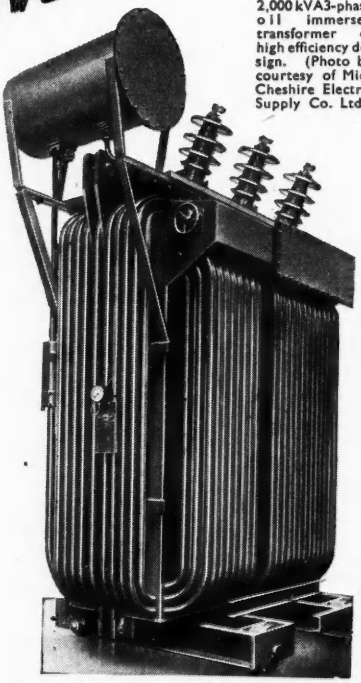

2,000 kVA 3-phase oil immersed transformer of high efficiency design. (Photo by courtesy of Mid-Cheshire Electric Supply Co. Ltd.)

FROM 1.2VA TO 2,000 kVA!

The "matchbox size" transformer pictured above fulfils its function of giving Power, in proportionate degree, as does the 2,000 kVA on the right. Both have had the thoughtful design and care in construction that go to the making of every "FOSTER" transformer.

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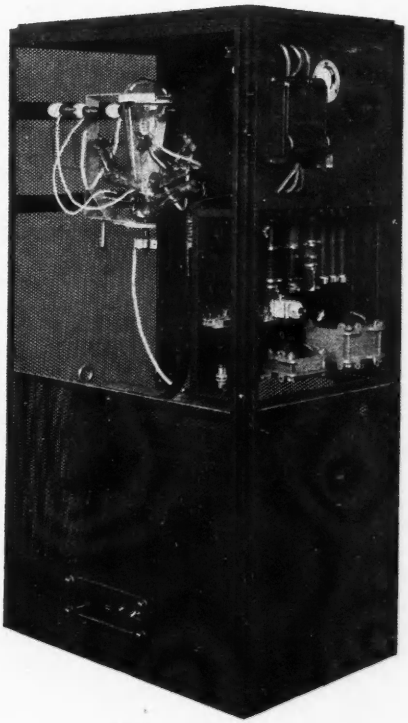
CRYPTON *Heavy Duty* BATTERY CHARGERS

WITH MERCURY ARC RECTIFICATION

Completely Reliable
No Replacements
Highest Efficiency
Lowest Charging Costs
Heavy Overload Capacity
Simple to Install
Automatic in Operation

The "Crypton" Mercury Arc Rectifier offers many unique advantages wherever large numbers of batteries are charged at rates from 10 amps, such as battery shops, commercial vehicle and bus depots and for the charging of electric vehicles. "Crypton" provides the most reliable and efficient type of plant available, so please ask us to quote whenever you are interested in Heavy Duty Battery Charging.



Model Illustrated:

"Crypton" Mercury Arc Rectifier for charging 48 cells at 45/25 amperes

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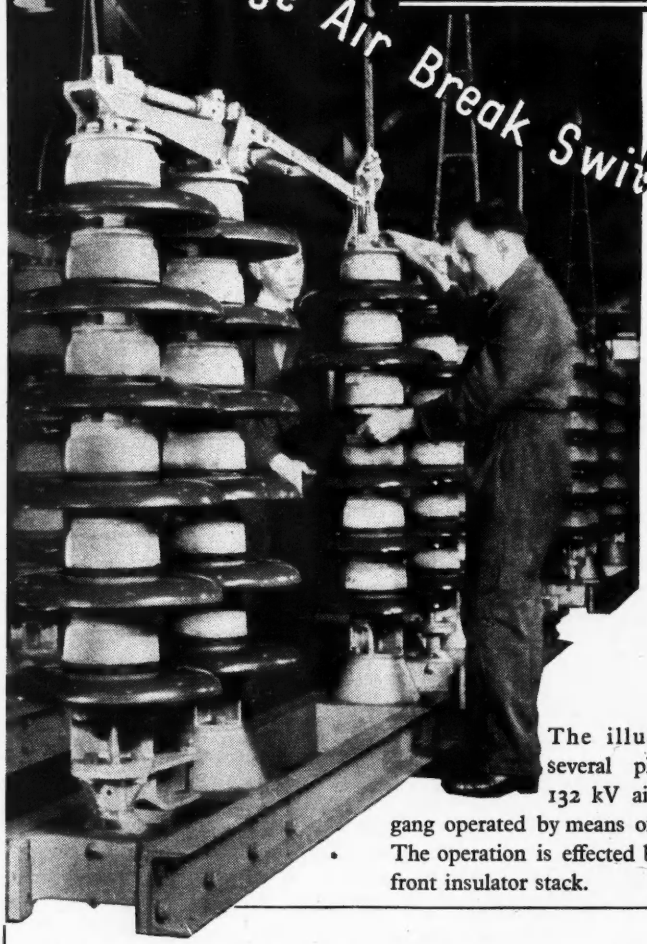
ASEA

High Voltage Air Break Switchgear



The illustration shows several phases of 3 pole 132 kV air-break isolators, gang operated by means of compressed air. The operation is effected by rotation of the front insulator stack.

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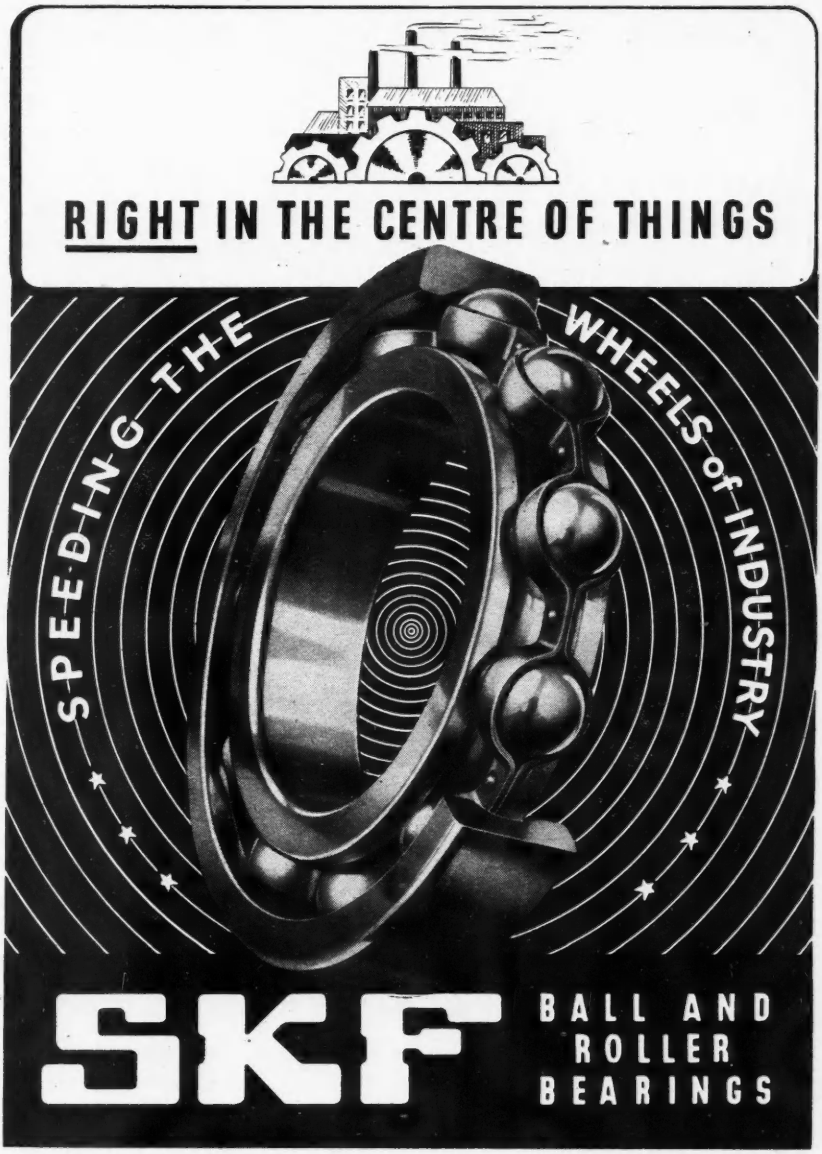
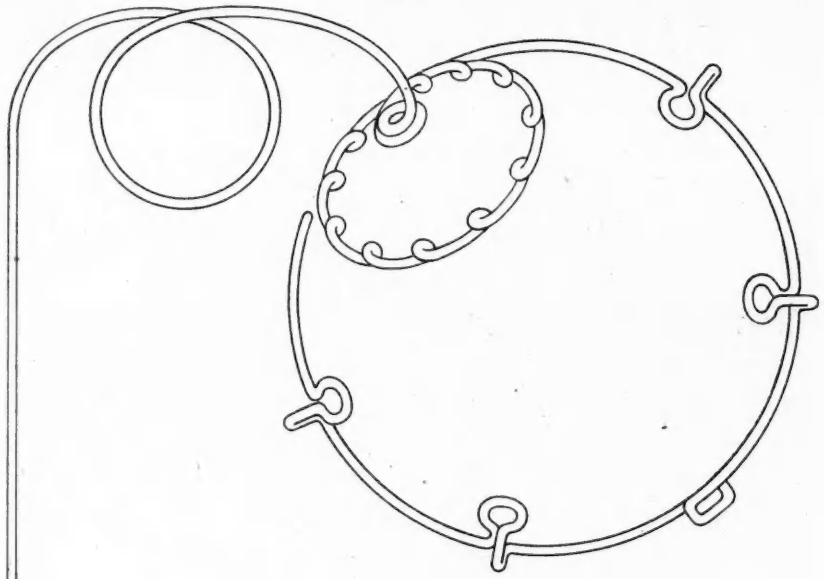

RIGHT IN THE CENTRE OF THINGS
SPEEDING THE WHEELS of INDUSTRY
SKF
BALL AND ROLLER BEARINGS
THE SKEFKO BALL BEARING COMPANY LTD · LUTON · BEDS



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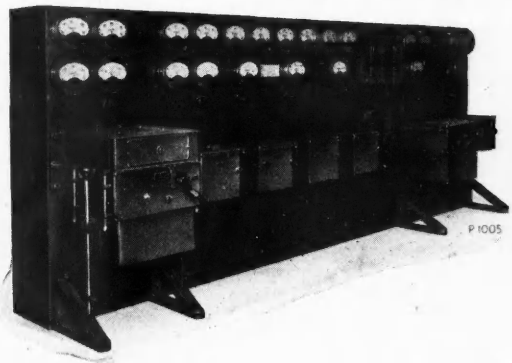

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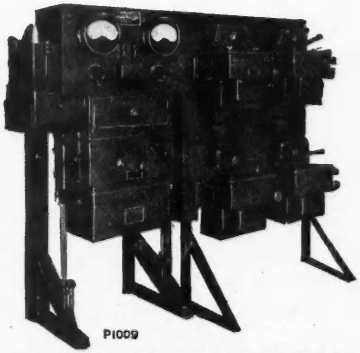
When it is desired we manufacture to customers' own ideas, our designs being very adaptable and based on upwards of 35 years' experience.



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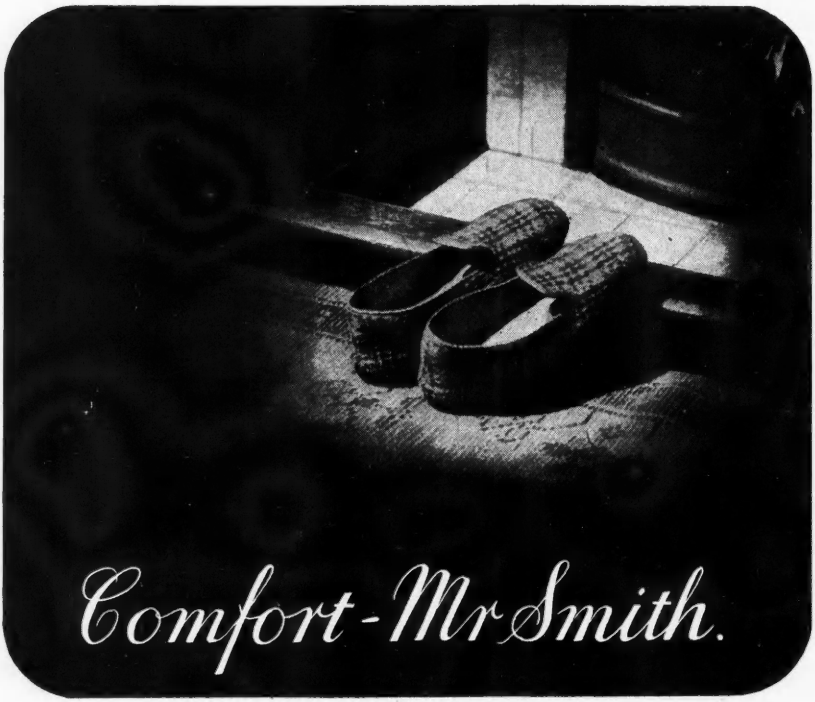
E.H.364



Whenever you need to concentrate it is easier if you are comfortable, particularly if you can see in comfort. In order that all workers can achieve their best results they need to see in comfort which means they must have good and suitably planned lighting. Benjamin Lighting is planned to provide the best seeing conditions for every worker; a Benjamin Lighting scheme can be prepared for any works, giving very real help towards maximum production.

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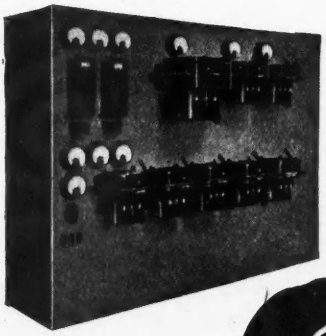

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Look into 'K' Gear

It is HANDY and ADAPTABLE to both CUBICLE and PEDESTAL arrangements.

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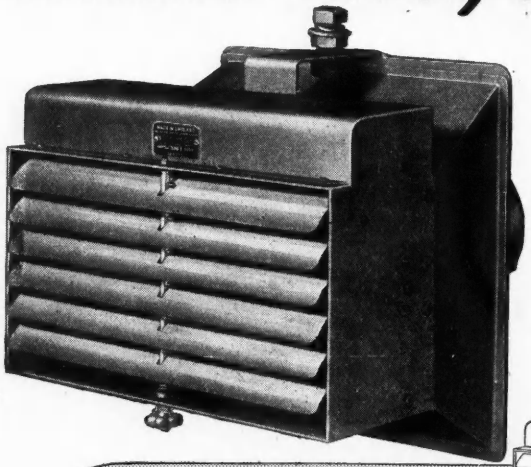

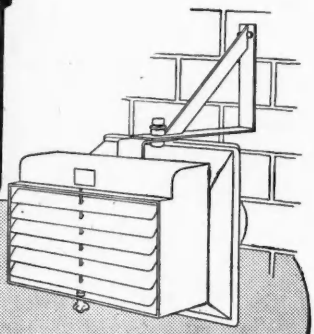

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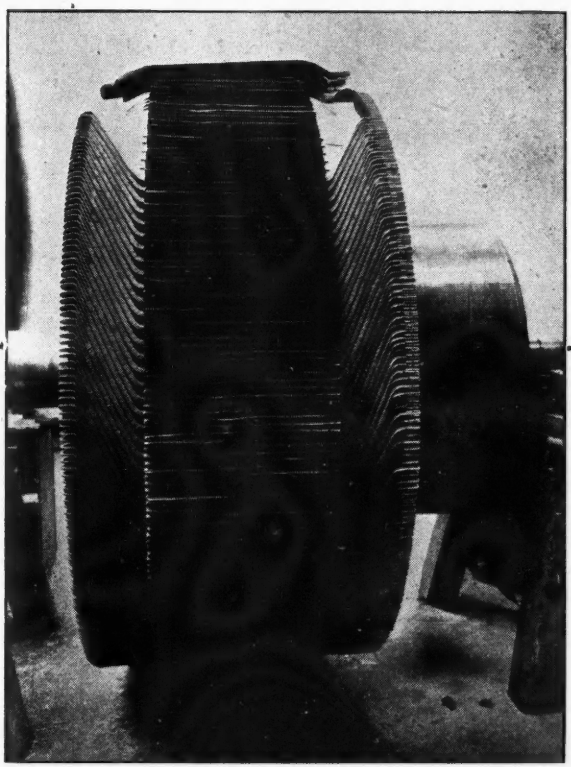

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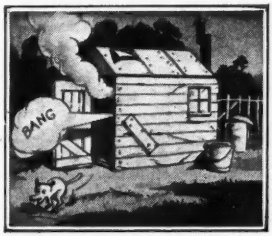
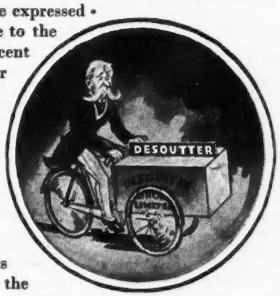


View of New Research Department.

It was our privilege a few days ago to be taken over one of the most modern and well equipped (some people would say *the* most modern and well-equipped) factories engaged in the design and manufacture of small power tools. This firm (which shall be nameless but there's no harm in guessing) is situated not a 1,000 miles from a famous aerodrome. On entering the front doors one finds oneself in a very modern reception hall with one of those staircases with no banisters, a very dinky glass case full of bits and pieces, all labelled and lit up, and a tessellated flooring (if that is how you spell it) representing a lump of epicyclic gearing. Very fascinating. There is also a very fine Sergeant who took our name and fingerprints.

After a pleasant interlude in the Managing Director's Office (discussing the Black Market and agreeing that it was more or less drinking liquid gold) we passed into the works where a buzz of happy voices and the smell of hot tea at once assailed us. These works appeared to us to be about twelve miles long. We walked up and down a great many aisles where everyone seemed to be extremely busy doing extremely clever things with extremely complicated machines. We were informed that all these people were making what were admitted (by my informants) to be the finest small power tools in the world. Drill Guns, Screwdrivers, Nutrunners, Shears, Nibblers, Grinders, Countersinking Tools, Bolt Milling Tools and many other ingenious gadgets. It seems to us at one time that we also saw what appeared to be metal legs being bent and pushed and pulled into shape but on attempting to put a question we were seized with hiccups and decided to leave the legs alone. We were informed (and had no means of proving it false) that up to the outbreak of the present 'incident' the tools, made in this works, were in use in every aircraft factory in the country without exception. We expressed our admiring surprise at this and asked if it were due to the tools being in any way superior to other makes. This innocent question caused a regrettable scene. The Managing Director fainted and had to be revived from a black bottle; the Works Manager became deep heliotrope in colour and started to beat us about the head with an iron bar; all the machinery stopped; the workers made threatening noises and we decided to catch the next trolley-bus down the Edgware Road.

View of Managing Director. The man who first made cork legs out of metal and Portable Tools portable.



View of the prompt and efficient Delivery Service.

We should like to make it clear (in case we have to call again) that this is in all respects a model works; that the tools made therein are lighter, better and in all respects more efficient than any other small power-tools; unless the latter are advertised in this publication in which case we would prefer to express no opinion. In conclusion we would state that if ever we required a small powerful electric or pneumatic drill, or any similar power tool, we should have no hesitation in going to this famous factory — provided we knew for certain that the Works Manager was out.

MINISTRY OF SUPPLY

Defence (General) Regulations 1939 No. 55. S.R. & O. 1942. No. 1770

AN ORDER

RUBBER MUST NOT BE DESTROYED, THROWN AWAY OR MIXED WITH REFUSE

The Minister of Supply in exercise of the powers conferred on him by Regulation 55 of the Defence (General) Regulations 1939, has made an Order which provides as follows :

1 No person shall, except under the authority of and in accordance with a licence granted or a special or general direction issued by the Minister of Supply,

(a) destroy any waste rubber

(b) throw away or abandon any waste rubber

(c) put any waste rubber in a refuse bin or other receptacle used for domestic or trade refuse, or

(d) cause or permit any waste rubber awaiting or in the course of collection or sale to be or become mixed with any material or article other than waste rubber.

Provided that nothing in this Order shall prohibit or restrict the destruction of any waste rubber if and so far as necessary in the course of any process of manufacture, or for the purpose of saving property from immediate danger of destruction or damage by fire.

2 (1) The holder of any licence granted under this Order shall comply with any conditions contained or incorporated in the licence.

(2) If any licence so granted is revoked by the Minister of Supply, the holder of the licence shall forthwith deliver up the licence to the Minister or as directed by him.

3 IN THIS ORDER : " *rubber* " includes reclaimed rubber, liquid latex, gutta percha and balata, and " *waste rubber* " means any worn-out, disused, discarded or waste material or article of the classes or descriptions specified in the Schedule to this Order, but does not include any material or article which is injurious to health or otherwise offensive.

4 This Order shall come into force on the 7th day of September, 1942, and may be cited as the Salvage of Waste Materials (No. 4) Order 1942.

THE SCHEDULE

(a) *Articles or materials of any of the following descriptions made wholly or partly of rubber* :—
Balloons • Balls — sports and toy • Bathing-caps • Beds — inflated and sponge • Bulbs — horn, surgical, etc. • Carpet underlay • Catapult strip • Corks and Closures • Corsets — all rubber • Crepe-soled Footwear • Cushions — inflated and sponge • Doorstops • Draught-excluders • Ear Plugs • Elastic Cord and Thread • Electric Cable and Wiring • Football Bladders • Footwear (including Wellingtons and Gum Boots) • Flooring and Tiling • Gloves • Goloshes • Grips — handlebars, etc. • Horse-shoes and pads • Hose and Tubing • Hot-water bottles • Jar-rings • Mats and Matting • Mattresses — inflated and sponge • Milking Rubbers • Pedal-rubbers • Radiator Hose • Rollers • Soles and Heels • Sponge-backed Flooring • Sponges • Squeegees • Stair-treads and nosings • Stopper rings • Teapot Spouts • Teats and Soothers • Tobacco Pouches • Tubing • Tyres — Pneumatic (Covers, Tubes and Flaps), Solid and Cushion of all types • Upholstery.

(b) *Articles or materials of any other description made wholly or mainly of rubber.*

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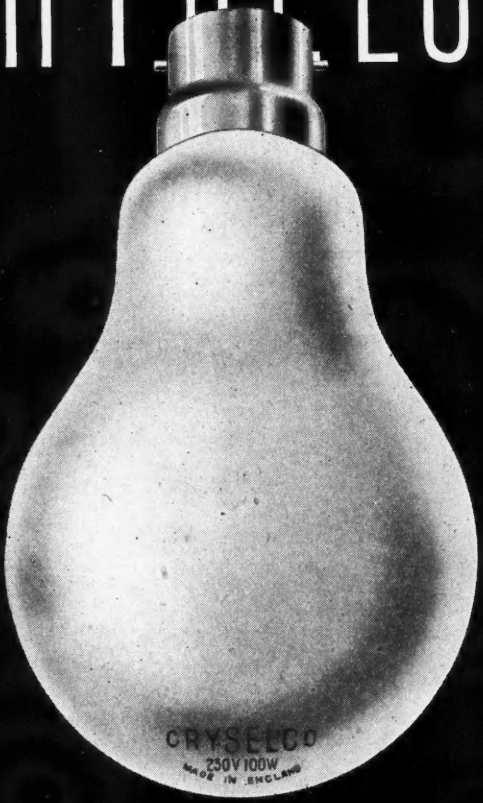

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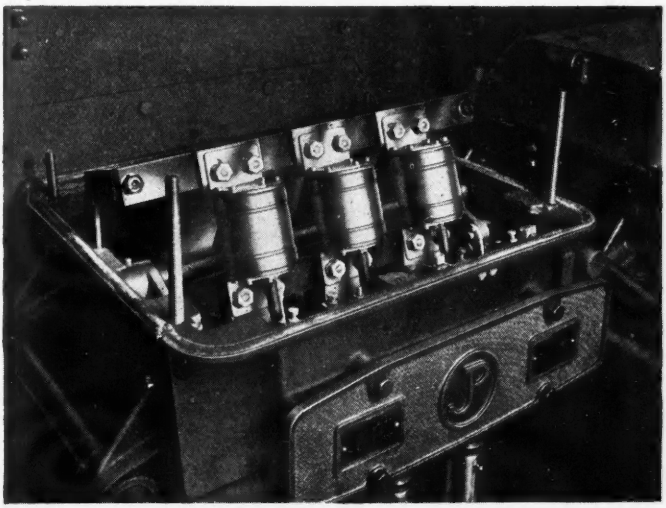

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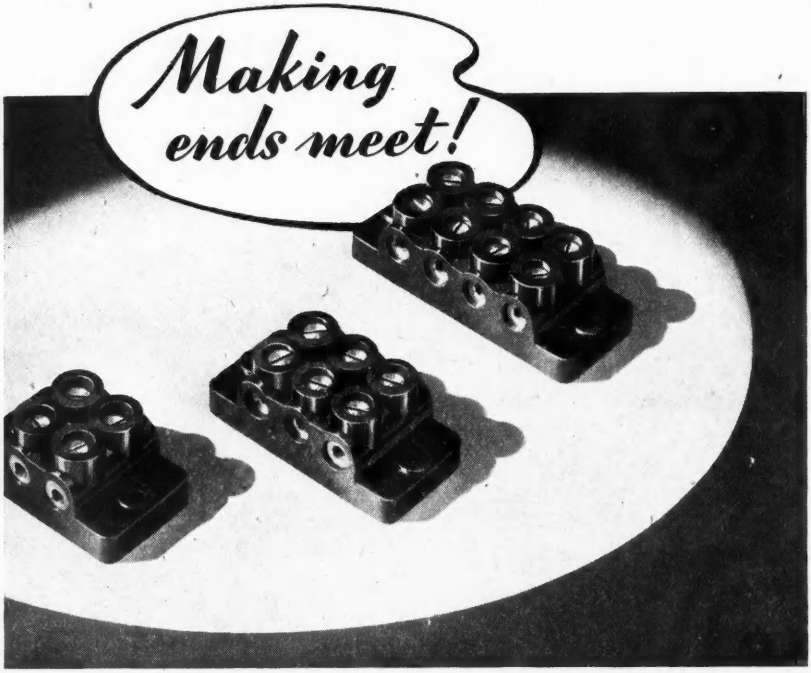

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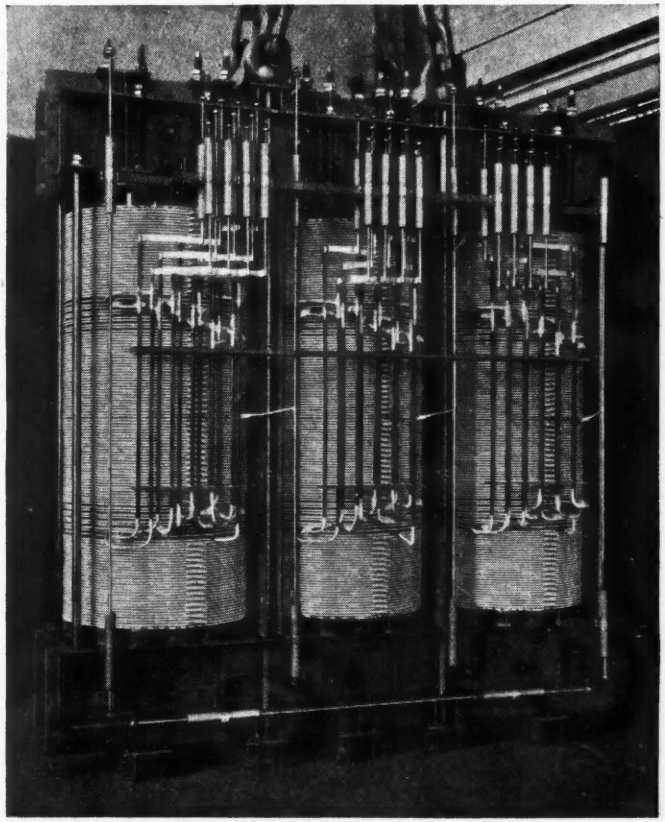

5.70

Attention to detail is the policy of the makers of BRUSH Transformers and amongst other features the rigidity and supporting of the tappings will be noted. Note also the multiple supports of the bottom yoke of the core and the direct lift from the bottom structure giving even weight distribution and freedom from alteration of stress in the core structure during lifting.

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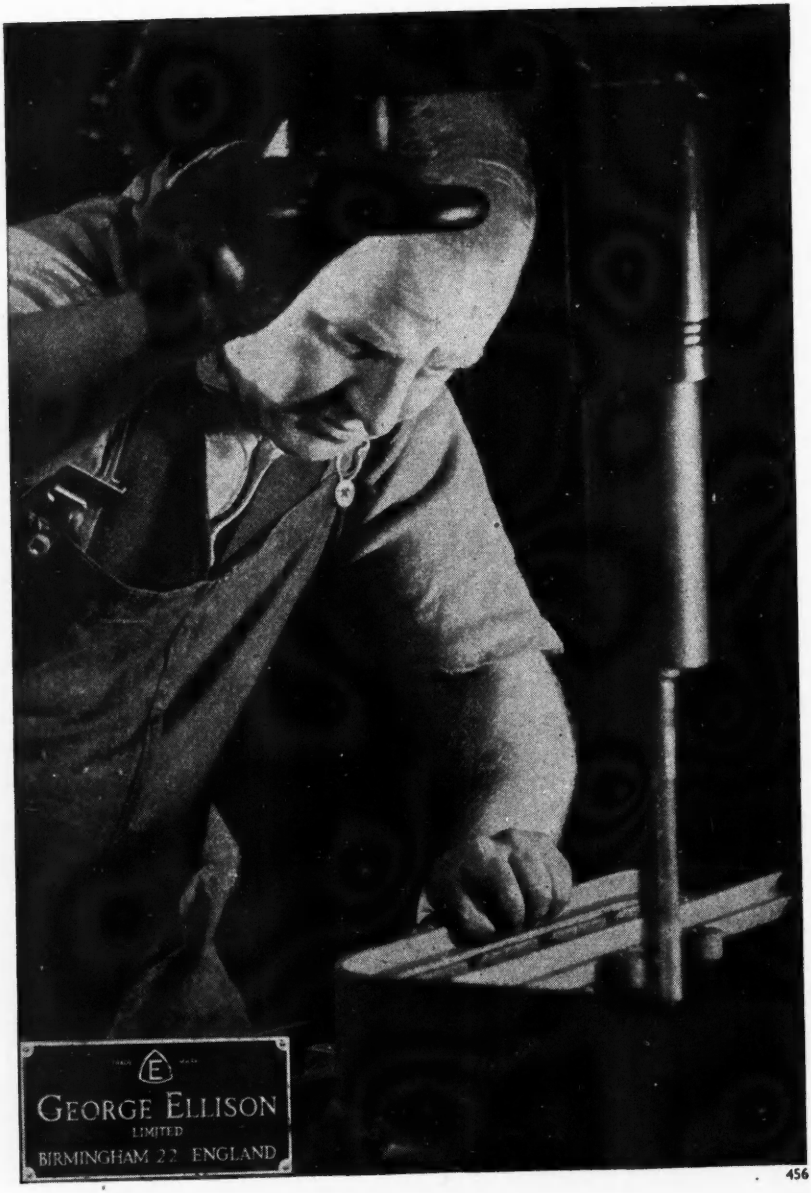

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ELECTRICAL REVIEW

Volume CXXXI — No. 3383

Friday, September 25, 1942

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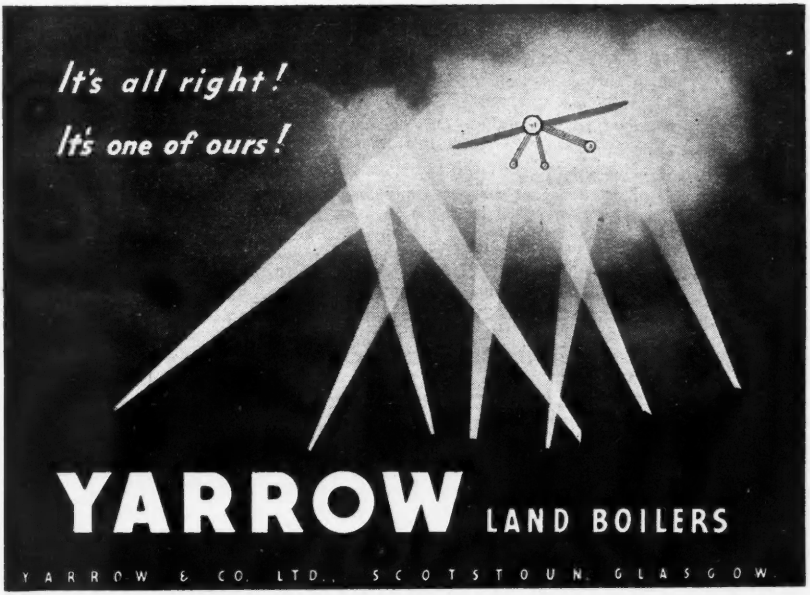

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXI. No. 3383. SEPTEMBER 25, 1942 6d. WEEKLY

Electrical Retailing

Possibilities of Betterment

THERE are many questions which it is difficult to discuss during the war. Any controversial speculation is viewed with distaste by those who consider that the immediate present is of far greater importance than a somewhat nebulous future. But to refrain from paying some regard to the future is to give tacit sanction to many doubtful practices which have either arisen during the war or have been intensified by war conditions.

There is the electrical retail trade, for instance. In the early days of the industry it was necessary for electrical contractors not only to persuade the public to let them put in electrical installations, they had also to exercise salesmanship in the matter of appliances. In this way they laid the foundations of to-day's extensive electrical business. Later, partly by their own neglect to realise the full possibilities and partly by external circumstances, they lost their grip of the appliance business and now they are responsible for a comparatively small part of the large volume of electrical sales.

Showrooms and Hire-Purchase

Among their earliest rivals were the electricity supply authorities who, backed by adequate funds, were able to set up showrooms and (more important) to institute hire and hire-purchase schemes.

A little later other tradespeople with established premises and showrooms saw that by adding the sale of domestic electrical apparatus to their original lines, and not bothering too much about "service after sale," they could skim a good deal of the cream from the electrical industry. Early in the field were the ironmongers who, with a certain amount of justification, claimed that all household appliances came within their ambit. There was a time when ironmongers were considered a thorn in the flesh by electrical retailers and the Electrical Fair Trading Council declined to grant them the representation on equal terms which they demanded.

Strange Forgetfulness

With this in mind, some recent remarks on the subject of "poaching" by "Vulcan" in the *Ironmonger* give occasion for a lift of the eyebrows. He said:—"Half a century ago the ironmonger for lack of organisation let the domestic side of the gas industry slip through his fingers. He has acted more wisely since electric appliances have supplanted a number of gas apparatus. The electrical department has become a recognised branch of the ironmongery business; but none can allege that by developing such a department any ironmonger has robbed another trader of his legitimate turnover."

The example of the ironmongers was soon followed by the multiple stores, which made further inroads into the electrical trader's "legitimate turnover." Then, the "most unkindest cut of all," the radio retailers joined in. The electrical trade in the early days of broadcasting, let the radio business go by default and a new class of trader turned up in the resultant scramble. Prices were cut to pieces and soon electrical

appliances (also at cut prices) were brought in to redress the balance.

It has been officially recognised as essential that traders adversely affected by the war shall be protected from further damage by a prohibition upon the starting up of new businesses; some such measure should have been taken long ago. There are indications that there may be some form of control after the war. It will be as well to ensure that we are not entirely a nation of shopkeepers, and electrical shopkeepers, at least, should be responsible people recognising their duty to the public. In this matter we hope for a strengthening of the hands of the Fair Trading Council.

Nickel

ONE of the materials widely employed in the electrical industry for which economy in use is a matter of urgency is nickel. Alloyed with other metals such as copper, the merits of the composition, including a low temperature coefficient, have established its position in connection with the construction of control resistances. Nevertheless, its use in present circumstances can seldom be justified, if alternatives are available, as they are shown to be in an article in this issue.

Overhead Lines

FIVE years ago, the Electricity Commissioners consented to certain modifications to their Overhead Line Regulations. Their object was to reduce the cost of high-voltage rural distribution with conductors up to 0.04 sq. in. From the experience so gained the Commissioners, with a view to economy in material, are now able to allow further relaxations, which may in some respects be adopted for larger lines also. The cutting of some of the ordinarily very necessary restrictions is drastic but fully justified in wartime.

Popular Publicity

IT is seldom that the demand for a newspaper is increased by a single advertisement. This has happened in a number of cases recently, the advertisement being one drawn up by the Edmundsons Group to encourage economical consumption. It showed in a graphic fashion how to read a meter and keep a record of the readings and was headed " Check up Every Sunday." The interest created among the public was so great that two of the papers in which the advertisement appeared actually inserted it free of charge in their following issues. That means something in these days of restricted advertising space.

In Reverse

DETAILS are given on another page of the plan for local fuel economy " battles." On the success of these individual drives will largely depend that of the campaign as a whole, and thus ultimately the decision whether compulsory rationing can or cannot be avoided. In pre-war days there existed friendly competition among electricity undertakings to achieve the highest sales per domestic consumer. If, now, they could publish similar figures for each quarter showing the proportionate *reduction* per domestic consumer compared with a year ago a useful " battle " incentive would be provided.

Coal Stocks

RECENT pronouncements on the general coal situation have not been encouraging. So far as public utilities are concerned, however, the Public Utilities Coal Committee recently reported that while stocks would probably not be so great as last winter it was hoped to meet essential requirements. The spreading out of excessive coal transport charges was recently suggested but it is now stated that in view of the magnitude of the sum which would be required by way of subsidy the Treasury has declined to go further with the matter. The Coal Committee is preparing a case for the examination of coal prices and the methods of fixing them for submission to the Ministry of Fuel and Power.

An Impracticable Idea

ELECTRIC power stations stand out from among industrial works in subordinating most considerations to securing fuel economy. There is literally no margin to be pared away, and the margin for the 10 per cent. saving called for recently by an area Fuel Controller simply does not exist. What salaries could have been commanded pre-war by experts able to save for electricity supply undertakings 1,500,000 tons of coal per annum ! The plea is complicated by the implication that risks (what the risks are is not clear to us) may be incurred in making the required saving. It is a pity that those experienced in power station operation should, seemingly, not have been consulted.

Economising Nickel

Alternative Alloys for Control Gear

The characteristics of suitable substitutes for nickel-alloy resistance materials are studied in order to afford guidance to manufacturers in their endeavours to meet the restrictions placed on nickel consumption

IN view of the need for economy in the consumption of nickel, the Non-Ferrous Metals Control is restricting the use of nickel-alloy resistance materials, particularly those containing about 45 per cent. nickel and 55 per cent. copper (for example, "Ferry," "Advance" and "Constantan").

On account of its low temperature coefficient, high resistance to corrosion and fairly high specific resistance 45/55 nickel-copper alloy is popular. It is easily wound into spirals and loops and can readily be soldered. Furthermore, its characteristics are uniform and it can be provided with an oxide

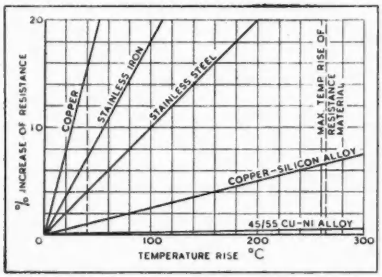


Fig. 1.—Temperature coefficients of various resistance materials

coating which acts as insulation between turns on close-wound resistances. Despite these advantages there are many cases where its use is not absolutely essential in wartime.

Importance of Temperature Coefficient

The temperature coefficient of the 45/55 nickel-copper alloy has the unusually low average value of 0·00002, corresponding closely with that for "Manganin," the use of which is almost entirely restricted to instrument work. Thus for a 100 deg. C. rise of temperature, the resistance of a coil of 45/55 alloy changes by an amount that is negligible, except for instruments. Fundamental facts in connection with the use of resistances in series with copper circuits, such as field windings, are as follows:—

(*a*) Since the resistance is always used in series with copper, which has a temperature coefficient of 0·004, all circuits have a temperature coefficient that is seldom negligible.

(*b*) Account can be taken of the temperature coefficient of a series resistance, and the resistance of the whole circuit at any temperature can be predetermined just as accurately as if the temperature coefficient of the control resistance were negligible.

(*c*) The control-gear manufacturer is not generally provided with very precise details regarding the operating conditions or internal characteristics of the machine for which he is supplying equipment and a large factor of safety is generally allowed.

(*d*) Few manufacturing processes are accurate to two parts in one thousand, and in addition British Standard Specification No. 115 permits a ± 5 per cent. tolerance in wire resistance.

A further point is that a resistance unit can usually be constructed from materials having widely varying resistivities without causing any appreciable variation in its overall bulk.

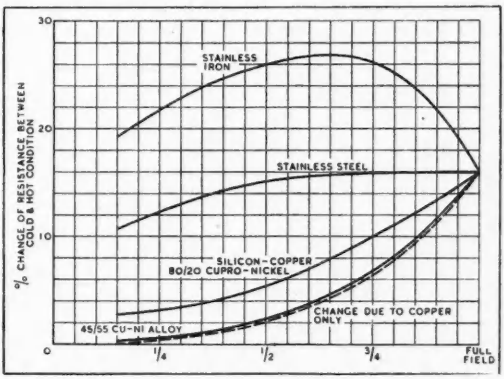


Fig. 2. — Resistance changes related to speed

Some idea of the percentage increase of resistance with temperature rise that can take

place with the various materials is given in fig. 1. When these resistance materials are joined in series with a copper coil, *e.g.*, a speed regulator in series with the field winding of a shunt machine, the combined items have "an overall temperature coefficient." The particular case illustrated in fig. 2 shows the percentage change of overall field resistance, between the minimum and maximum temperatures of the machine and its resistance, when running at various speeds. At the minimum speed, *i.e.*, when the field current is a maximum, the change of resistance (which is entirely due to the field winding itself) is 16 per cent., and this is obviously independent of the type of material used for the speed controller.

It has been assumed that the field winding attains a temperature of 40 deg. C. rise at the maximum current and that the control resistance reaches a temperature of 265 deg. C. above that of the ambient air. It is also assumed that after each notch comes into action at least part of the resistance reaches the maximum permissible temperature. The lowest curve shows the percentage change of resistance at various fractions of full field due to the copper part of the circuit only. When the control resistance is of 45/55 alloy there is only a slight modification.

If copper-silicon alloy is employed (the temperature coefficient of which is 0·00025) then, for example, at three-quarters of full field there is 10 per cent. change of resistance on heating up as compared with just over 6 per cent. with 45/55. The value is increased to 16 per cent. if stainless steel is employed and to 26 per cent. for silicon steel and stainless iron. At half full-field current the percentage change increases from 2 per cent. with 45/55 alloy to 5 per cent. with copper silicon alloy, 15 per cent. with stainless steel and 26 per cent. with stainless iron.

This diagram shows that often on theoretical grounds copper-silicon, or a material such as 80/20 cupro-nickel having a similar temperature coefficient, could readily be substituted for 45/55 alloy in the case of speed controllers without noticeable change. In other cases stainless steel would be possible or even stainless iron, depending on the operating conditions. Naturally if the maximum rise of temperature of the resistance is less than 265 deg. C. the percentage change of speed will be smaller. This set of curves shows that changes of resistance must take place in any circuit due to the presence of copper and that the increase of this change due to using other resistance materials than 45/55 alloy is not always unduly large.

An important point is that the heat

CHARACTERISTICS OF RESISTANCE MATERIALS

Material	Specific Resistance microhms/cm³	Temperature co-efficient per ° C	% Increase of resistance for 100° C rise of temperature	Approximate specific gravity	Ultimate tensile strength in soft condition tons/sq. in.	Approximate composition
45/55 Nickel-copper Alloy ..	48	·00002	0·2	8·9	27	45% Ni, 55% Cu.
Mild steel ..	11–12	·0016–·0042	16–42	7·8	30	—
Silicon bronze ..	26	·00025	2·5	8·5	25	96% Cu, 3% Si, 1% Mn.
80/20 Cupro-nickel ..	27	·00024	2·4	8·9	23	80% Cu, 20% Ni.
Silicon steel ..	17·5	·0032	32	7·8	—	1% Si, rem. Fe.
	35–42	·0012–·0017	12–17	7·8	—	2–3% Si, rem. Fe.
Manganin ..	40–43	<— ·0001*	<—1·0	8·5	—	85% Cu, 10–14% Mn. 1–4% Ni.
Stainless iron ..	50–60	·0015/·0018	15–18	7·7	30	12–18% Cr, bal. Fe.
Stainless steel ..	70–75	·0010/·0012	10–12	7·9	37–45	18% Cr, 8% Ni, 74% Fe.
Nickel-chrome steel	80–85	·00055/·0007	5·5–7	—	—	10% Cr, 20% Ni, 70% Fe.
Cast iron ..	75–100	·0019	19	6·8–7·6	—	—
Non-magnetic cast iron	130–150	·00045	4·5	7·0–7·6	—	—

* This is the mean value over the range 20–250° C. Over the range 10–40° C. the value is of the order of — ·000005.

capacity of a winding is sometimes much higher than that of the control resistance and thus its change of temperature takes place much more slowly than that of the resistance. In exacting duty cycles where, for example, there is frequent stopping and starting, the temperature of the field can be assumed to remain practically constant, whereas that of the resistance unit fluctuates considerably. In such cases, particularly at high speeds, these fluctuations may result in undesirable speed variations and a material such as silicon-bronze or cupro-nickel must be employed, or possibly on rare occasions, even 45/55 alloy.

The use of high-temperature coefficient materials in control circuits has been criticised on the ground that one adjustment is inadequate, due to the somewhat slow change of resistance with temperature. Fig. 2 shows, however, that at the lower speeds an appreciable amount of this change is due to the field winding itself which changes in temperature very much more slowly than the resistance. Consequently, this trouble is likely to arise whatever resistance material is employed.

Item (*b*) of the fundamental facts mentioned above covers the case where a fixed speed is required on any particular notch of a controller. Such a speed can be obtained just as accurately if the control resistance has a temperature coefficient as if it has not, since the resistance in a short while attains a steady value which can be known quite sufficiently accurately—certainly as accurately as the resistance of the field winding.

The speed controllers referred to above are shunt controllers for shunt or compound-wound machines. With series machines the speed automatically adjusts itself in accordance with the load and there is seldom, if ever, any necessity for using 45/55 alloy resistance materials for this purpose. Speed control of AC slip-ring motors is generally by means of resistance in the rotor circuit, and most of the arguments given above are applicable; there is seldom any justification for using 45/55 alloy.

With regard to AC commutator motors, speed control is generally by adjustment of brush position or by the use of an induction regulator. Brush-position-control motors can adequately be provided with some other type of resistance material than 45/55 alloy for their own control units.

The Ward Leonard control system is usually somewhat complicated, particularly with planers, for which there seems to be some case for using 45/55 alloy, but not necessarily in all cases with this method of control.

Starters

With hand-starting of electric motors the variation in the conditions between different cases destroys the justification for employing a low-temperature-coefficient material. With automatic starting conditions are more stable, but even so the use of a particularly low temperature coefficient is unwarranted. The resistances are in circuit for only a short time and a change of resistance during this period has no appreciable influence on satisfactory starting. Although the various sections of resistance in a starter will have a different value in accordance with the notch position of the control lever, the actual operating conditions are likely to be so variable that precision of design to this extent is unjustified.

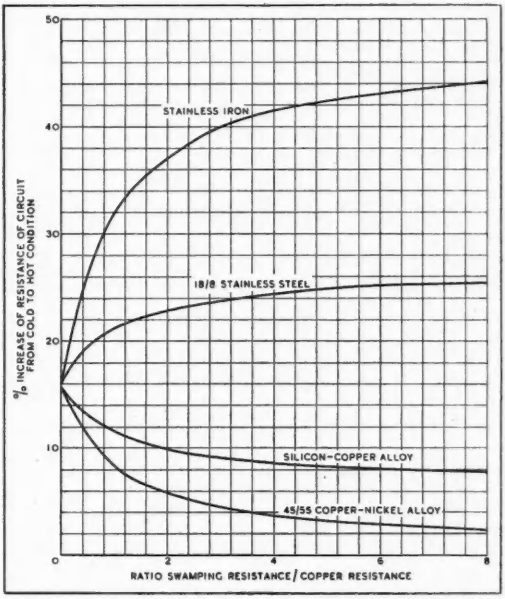


Fig. 3.—Change of resistance with temperature for ballast resistances

Current Control

Series resistances are often employed for control gear, *e.g.*, for plating plants, welding equipment and arc lamps. In the last case the purpose of the series resistance is to limit the current after the arc is struck and thus,

provided the correct value of resistance is attained at the full arc current, it is of no significance whether or not any change of resistance takes place during the first few minutes. This is a case where the use of 45/55 alloy at the present time is unjustified.

It is highly improbable that any plating process is adversely affected by a small percentage variation in the current. The precision required may justify avoidance of the highest temperature coefficient materials, though this would apply only in a limited number of cases. An essential requirement of any material used for this application is good corrosion resistance.

For slide-wire rheostats no alternative material is available at the present time, since these units are wound with adjacent turns in contact, and insulated from one another by a special coating which can be produced on nickel-copper wire and not on alternatives.

Ballast Resistances

Not infrequently a fixed resistance of 45/55 nickel-copper alloy is connected in series with a coil for the purpose either of reducing the current, minimising the effect of the temperature coefficient of the copper part of the circuit, or providing special circuit characteristics such as high ratio of resistance to inductance. The lowest curve in fig. 3 applies to 45/55 alloy and shows that the change of resistance is reduced from 16 per cent. (for a 40 deg. C. rise) to 6 per cent. if the ratio is 2 to 1, and to 2 per cent. if it is 8 to 1. This assumes that the swamping resistance attains a temperature of 265 deg. C., which is not always the case with resistances used in this way.

If silicon bronze or 80/20 cupro-nickel, for instance, is employed, the change of resistance is approximately 10 per cent. for a 2 to 1 ratio, and 8 per cent. for 8 to 1. A lower operating temperature of the resistances would improve these figures. With stainless steel or stainless iron the change of resistance with temperature is increased and this can only be avoided by operating at an appreciably lower temperature. There are limits to such a scheme because a lower temperature can only be secured by using more material.

Alternative Materials

In Germany at the present time no nickel-copper alloy is used. The only alternative materials which have such a low temperature coefficient as 45/55 alloy are those of the "Manganin" class. These materials, of which "Minalpha," "Telcuman" and "Tarnac" are British equivalents, are copper alloys containing 10 to 14 per cent. manganese and usually about 2 per cent. of nickel. "Manganin" is most used in instrument work for swamping resistances and more particularly for shunts. Its resistivity is about 40 microhms per cm.[3] The temperature coefficient varies with temperature, but is adjusted to have a particularly low mean value from 0 to 40 deg. C.

So far as is known this material has never been used up to the temperatures permitted for controller resistances, *viz.*, 265 deg. C. rise, at which it might not be entirely satisfactory. It has a less satisfactory resistance than 45/55 to salt-water spray—the corrosion rate of one type of sheet material exposed to sea water being about five times as much, but other types of "Manganin" have given much lower corrosion rates. Tests up to a temperature of 280 deg. C. have recently been carried out on a British equivalent of "Manganin." Between 100 and 250 deg. C. the temperature coefficient is 0.000087 and the resistance returns to its initial value on cooling. Owing to oxidation the material is unsuitable for use above 250 deg. C.

Whilst "Manganin" can be substituted for all instrument purposes, it is not an immediate substitute for other uses, for which a ferrous material, such as mild steel (sherardised), silicon steel, stainless iron or stainless steel should be substituted when possible. The characteristics of these materials are set out in the table on page 388. The stainless steel suggested contains 18 per cent. chromium and 8 per cent. nickel, and should therefore be avoided if the other ferrous materials are suitable.

Even less desirable than 18 Cr/8Ni (stainless) steel is 20 per cent. nickel, 10 per cent. chrome steel, since it contains more nickel. Having, however, about half the temperature coefficient of stainless steel and a higher resistivity, it is particularly suitable for some applications. Stainless iron has a resistivity which is nearer to that of 45/55 than any other material and can therefore be substituted with the minimum change of gauge. If there is any risk of the 18/8 stainless steel attaining a temperature in excess of 500 deg. C. on overload, it should be of the stabilised type.

Silicon steel is used for core plates and stampings for electrical machines and transformers, and is therefore generally available only in sheet form. It is not particularly resistant to corrosion and should therefore be sherardised, in which condition it is satisfactory up to 300 deg. C. Aluminising is an alternative process.

Of non-ferrous materials there are the cupro-nickels of which the alloy containing 80 per cent. copper and 20 per cent. nickel is the most suitable composition; 85/15 and 90/10 can be used, but their resistivities are lower and temperature coefficients higher than that of 80/20. As the specific resistance of 80/20 is lower than that of the 45/55 alloy, the saving in nickel achieved may be greater than is indicated by difference in composition. This alloy has somewhat lower resistance than 45/55 alloy to salt spray (sea water)—but it still has adequate properties in this direction.

Silicon bronze, an alternative material, is available under the trade names of " Everdur" and " P.M.G." metal. " Everdur A " contains 96 per cent. copper, 3 per cent. silicon and 1 per cent. manganese, and has a resistivity and temperature coefficient which are practically the same as those of 80/20 cupro-nickel. Silicon bronze is claimed to have particularly good resistance to salt spray. In locations exposed to special corrosion, further detailed inquiry should be made before choosing any material.

It cannot be too strongly emphasised that in general a change of resistance material will not involve a change in overall dimensions of a resistance unit. Whenever a change of resistivity can be accommodated by a change of cross-section area, as is usual, the overall dimensions of the complete unit are unchanged. Consequently, since the total resistance is unchanged, the temperature rise of the container will be the same. Variations from this rule occur only in a few special cases.

In other cases adjustment of length and cross-section of the material can readily be made to compensate for a change of resistivity so that the dimensions of the container remain unaltered and thus call for the minimum alteration in manufacturing procedure.

Investigations and development work are proceeding and, within the next twelve months, a substantial change from 45/55 alloy to ferrous or other resistance materials will be effected in order to minimise the consumption of nickel. Such economies are essential as a wartime expedient, and any departures from pre-war standards involved must be regarded as temporary measures only.

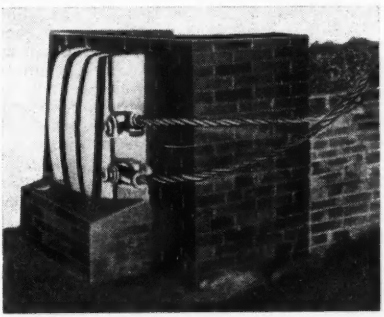
Grinding Wheels

Composition of Abrasives from Electric Furnaces

By A. G. Arend

MODERN grinding wheels are made almost entirely of abrasive materials derived from electric furnaces, the hardness so obtainable surpassing that of most industrial substances. The principal work is conducted abroad and the furnaces employed are of crude types. These hard substances were originally by-products of furnaces used for other purposes; the use of furnaces exclusively for their manufacture has increased the cost of production.

Carborundum is an artificial silicon carbide mineral. The bluish-black crystals are larger and harder than the colourless crystals of aluminium oxide, which is made by arc-fusing bauxite, being an artificial corundum. The latter is a Hindu word which means " gemstone," various colours being imparted by different metallic oxides. Thus sapphire is a titanic blue variety and ruby a chromic red; off-colour specimens serve as pivot bearings in watches. Corundum is colourless when pure, being next to the diamond in hardness and transparency to X-rays.



Electrode entry to single-phase open top furnace for producing carborundum

Carborundum is prepared exclusively on resistance hearths, which are set up in batteries; those of medium sizes are most easily manipulated and provide the best quality of product, despite their somewhat lower thermal efficiency. Contrary to other furnace experience, it is found that the associated transformers and oil-immersed switchgear cause very little trouble.

A furnace of intermediate size will take an increasing amperage, AC at 230 V, due to fall of resistance as its core heats up. The load will reach its full value after three hours, the voltage being correspondingly reduced with further increases up to some 20,000 A at 75 V after 34 hours of treatment. Such a hearth may be 30 ft. long by 10 ft. in diameter with a core 3 ft. in diameter.

Some of these furnaces seem outwardly to be poorly constructed. For instance, a typical shell may consist of two parallel walls 5 ft. wide, 5 ft. high and 15 ft. apart, with 3-in. diameter carbon electrodes passing through the walls. They are packed tightly inside with coke and are directly connected outside to a transformer, starting with 1,700 A at 190 V and rising to 6,000 A at 125 V as the resistance diminishes. When the charge melts and sinks inward, more material is added until some

14 tons are treated before withdrawal. The manner in which the mass sinks is important, since it directly influences what additions may be made to the charge and the resistance set up therein.

Composition of Charge

The carbon content of the charges introduced into the furnaces may be in the form of petroleum, coke, or anthracite, but sometimes additions are made of graphitic materials from the cores of old charges.

For preparing carborundum the percentage composition of the charge ranges from 52 to 58 per cent. sand, 30 to 35 per cent. coke, 7 to 10 per cent. sawdust, and 2 to 5 per cent. salt. The sawdust causes porosity to allow the stream of gases evolved to pass off evenly and uniformly, while the salt acts as a flux for the volatile chlorides of iron and aluminium. A typical analysis of the carborundum produced is 75 per cent. silicon carbide, 20 per cent. silica, 3 per cent. alumina, 1 per cent. each of ferric oxide, lime and magnesia.

The charge is filled into the lower level of the electrodes, the heating core of granulated core introduced along the length of the furnace, and any intervening space filled in with fine coke powder. Efficiency depends on the disposition of the charge and the dimensions of the hearth, as the current density determines the temperature raised (just above 4,000 deg. F.) and the rate at which heat travels outwards from the core.

There is considerable contraction and much gas is evolved, while graphite forms a ring around the core. The product is of a crude order in layers which are broken up sieved, washed and graded. The fine material, or siloxicon, is separated for furnace lining purposes, and the selected blue or green tinted crystals are removed to the grinding wheel department.

Single-phase Furnace

For making alumina abrasives a simple single-phase open-top electric furnace is used with one large graphite electrode introduced from above. With 2,500 A at 110 V, about 3 tons of alundum in its different forms is produced in 24 hours. The material is often cast into ingot blocks, which are later broken up and graded into different qualities.

A typical charge consists of 1,700 lb. of bauxite of 52 per cent. alumina content, 100 lb. of coke, and 350 lb. of iron borings. Scrap iron is also added to reduce silica when necessary. The furnace simply has carbon blocks embedded in the hearth, and operations are started by manipulating the top electrode until an arc is formed after which the melting proceeds almost without attention until the charge is tapped. This simple form of melting results in about 3·8 tons being obtained per kW-year.

Typical analysis of the material is 97·4 per cent. alumina, 0·9 per cent. silica, 1·28 per cent. titanium oxide, and 0·42 per cent. ferric oxide. The amount of electricity consumed is considerable, in fact, more than for almost any other process, so that every effort has to be made to obviate any undue losses.

The artificial abrasive is first broken into lumps and reduced in jaw-crushers, after which the mass is ground in specially constructed pan-mills and ball-mills. All fine matter which is formed is sucked off from the mills by means of fans, and later utilised for making polishing powders, papers, etc. The ground mass, after selection, is puddled and wet ground, then moulded to grinding wheel shape in paper moulds held within iron shells.

Making the Wheels

There are different methods of forming these wheels, depending on the uses to which they are to be applied. Thus the more rapid system of shaping in a hydraulic press does not give such a sound product as the casting method which, although slower, makes the best wheels. With the pressed product the bottom face of the wheel is different from the top, and hence the same consistency cannot be expected. Binders are used in the form of glue, dextrine, and clay, while rubber and resinoid are also included, and a third variety requires shellac and sodium silicate.

The sieved and graded particles which have passed through a definite mesh are mixed with these binders, slowly steam-dried, and shaped on a circular table where the arbor is added. Rubber has to be included in the special types of grinders required for dealing with pen points and other fine work.

The majority of the moulded and shaped wheels are vitrified in cylindrical kilns, and are packed into cylindrical saggars one on top of the other to economise in space. Coal firing sometimes proceeds for six days, causing crystallisation and re-crystallisation, so that the particles are fritted together. In the latest oil-fired hearths, steel trucks manipulated by chains are slowly passed through by hydraulic means. The packing sand is removed on a facing machine, after which the wheels are accurately ground and trued.

Molten lead is run into the hole with a solid core to form the arbor when it solidifies. Wheels for reducing wood pulp are made in segments, reinforced by steel sections between each segment. Before despatch to the market the wheels are tested for balance and limits of speed at which they may be safely revolved (50 per cent. higher than in practice) while hardness is tested by blows from an electric hammer.

Although the final forming of the wheels involves much work and attention, successful production is almost entirely dependent upon the initial preparation in the electric furnace, which imparts the desirable physical characteristics.

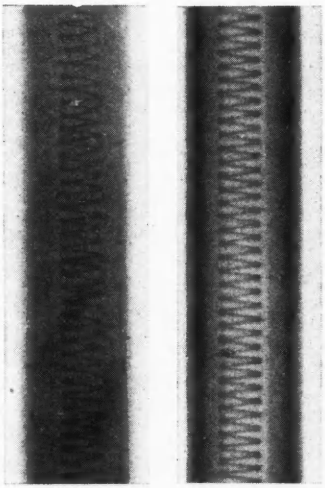
Industrial Radiography

Examination of Electrical Apparatus

Improvements in the technique of X-ray examination as employed in the electrical manufacturing industry have enabled negatives of greater clarity and higher quality to be obtained

THE applications of radiography to industry have developed apace, not only for the examination of metal castings and welds, but also of completed assemblies. The inspection of such products as thermionic valves, boiling rings, arc carbons, etc., previously impracticable or ineffective by visual or mechanical methods, has been rendered comparatively simple by the use of radiographic technique, the versatility of which, and the accuracy of the results obtained, has placed a powerful tool at the disposal of industry.

For the majority of industrial applications the X-ray tube should be capable of working for a short period at from 150 to 200 kV. The X-ray beam emerging from the object is usually examined photographically, the photographic film being housed in a cassette of special construction. If, however, a sufficiently powerful source is used (tubes have been designed to operate at 1,000 kV) it is possible to use a fluorescent screen for observation. In the latter case full protection for the operator must be provided by arranging for the screen to be viewed indirectly through a mirror. The fluorescent screen method has the disadvantage that fine detail cannot be observed so readily as by photographic means owing to the grain on the screen. For certain routine observations, however, some sacrifice of detail may be practicable on the score of cheapness and rapidity of observation.



(a) (b)

Fig. 1.—Improved clarity and quality of X-ray negatives obtained by filtration of the beam. (a) No filter or screen. (b) With lead filter and lead screen

The apparatus used in the G.E.C. Research Laboratories is of the photographic type and comprises a hot filament X-ray tube with tungsten anticathode and line focus. The tube is energised from a transformer and high-voltage rectifier and can be operated at up to 160 kV. It is movable up and down a vertical axis and can also be rotated through a small angle about this axis. The object to be radiographed and the film holder are on a separate stand and both can be moved independently of one another. The object is generally 2 or 3 ft. from the window of the X-ray tube, according to its size. At a distance of 3 ft. the useful field covered by the X-ray beam is of an area of approximately 12 in. by 15 in. Although for small subjects a considerably smaller distance than 2 ft. might be used, there is likely to be some loss of definition of the image owing to the finite size of the source of the X-radiation.

An aluminium cassette contains the X-ray film, and in most instances no luminescent intensifying screens are employed. Although in conjunction with double-coated X-ray film they may decrease the photographic exposure required to as little as a twentieth of the time, there is definite loss of fine detail. This is partly owing to the finite size of the particles of the fluorescent powder of which the intensifying screens are essentially composed; they give the X-ray negative a coarse-grained character. Luminescent screens continue, of course, to be widely employed in medical work where the slight loss in definition is not in general so noticeable.

Filtration of the X-ray beam by inserting thin metal screens in the path of the beam causes the clarity and quality of X-ray negatives to be appreciably improved (fig. 1). The distribution of energy in the continuous radiation from an X-ray tube is related to the applied voltage (fig. 2). The peak of intensity moves towards the shorter wavelength end of the spectrum as the voltage rises. It is thus possible to increase the penetrating power of the X-radiation merely

by raising the voltage applied to the X-ray tube. But at the higher voltage the intensity of the longer wavelength radiation is also greater, which is undesirable, since the unwanted background on the photographic film is in a large measure associated with scattered longer wavelength radiation. If a thin sheet of metallic lead be placed over the window of the X-ray tube the longer wavelength radiation is absorbed, while the more useful shorter wavelength radiation is but little reduced in intensity. By choosing carefully the kind and thickness of the metallic filter it is possible to adjust the distribution of energy in the X-ray beam to suit the subject under examination. The chief metals employed are copper, molybdenum, and lead.

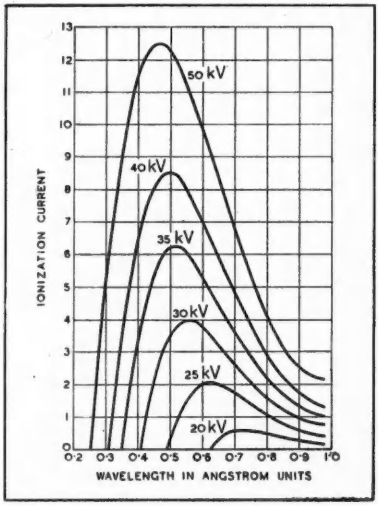


Fig. 2.—Variation with voltage of the distribution of intensity in an X-ray beam from a tungsten anticathode

At the higher voltages the clarity of the X-ray negative is further improved by the employment of what are generally referred to as lead intensifying screens, consisting of a sheet of metallic lead of about 0.1 mm. in thickness placed in the cassette against the front of the X-ray film. The intensifying action of the screen appears to be largely associated with the excitation of secondary electrons from the metal by the primary X-ray beam. The intensification factor is much less than for luminescent screens and is not greater than some two times at 150 kV. It decreases with lower voltages.

A second important function of the metal screen is to obviate scatter and re-radiation from the specimen under examination. The incident X-radiation, particularly the longer wavelength portion, is always scattered to some extent at oblique angles during passage through the specimen. If this scattered radiation is allowed to strike the film it causes general fog which impairs the definition of the image. Although the scatter is to a large extent reduced by the first method of filtration described above, the lead screen makes a further contribution to filtration. In many instances a second lead screen is used to back the film outside the cassette. It may be 0.2 mm. to 0.3 mm. in thickness and has some intensifying effect. Though of less value than the front screen, it also prevents the film being fogged by scattering from the walls and surrounding objects. One other advantage of lead intensifying screens is that the radiography of complex objects is greatly facilitated thereby because, owing to their peculiar characteristics, over-exposure over the thin parts is reduced and the relative exposure over the thicker parts is increased.

Radiography has enabled the whole electrode assembly to be viewed at any stage during the manufacture or subsequent life of radio valves. The problem has been to choose such conditions that the outer copper anode was penetrated by X-rays of a quality that would sharply delineate the tungsten and molybdenum inner electrodes while still leaving a clearly defined outline of the anode to give information about the concentricity of the whole assembly. At 150 kV, with a combination of lead filter and lead intensifying

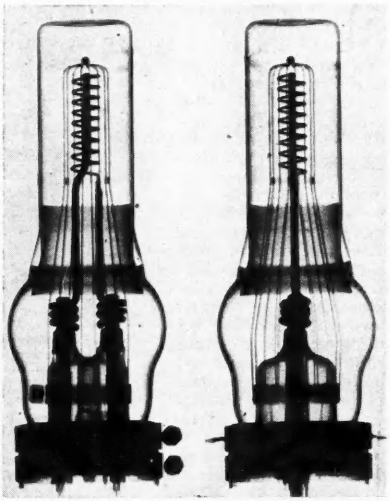


Fig. 3.—Radiographs in two directions at right-angles of a small transmitting type valve; 2 min. at 130 kV, lead filter and lead screen

screen, the photographic image is sensibly uniform, notwithstanding the considerable variation in thickness and the appreciable differences in density of the components.

The technique has been extended to many special types of small thermionic valve of comparatively complex electrode assembly where the clearances are particularly critical. In some instances every single valve may be subjected to radiographic scrutiny before it is accepted as satisfactory, and production would be seriously handicapped were not this routine method available. For this acceptance test two radiographs are taken of the valve in directions at right angles to one another so that a most complete picture of the whole assembly is available. Fig. 3 shows the two photographs of such a small valve.

In the development of new types of valve the arranging and positioning of the electrodes is greatly aided by radiographic examination. The modifications required, for example, to ensure adequate clearances and freedom from distortion are much simplified if accurate measurements can be made on an X-ray photograph. Causes of failure are also usefully investigated without the necessity of dismantling the valve. A series of radiographs taken at various stages during life enables any displacements in the components of the electrode assembly to be followed, and may prove a useful guide to improvements in design. Examination is, moreover, possible with the cathodes in operation so that distortion, or change in position, as a result of the rise in temperature can be noted.

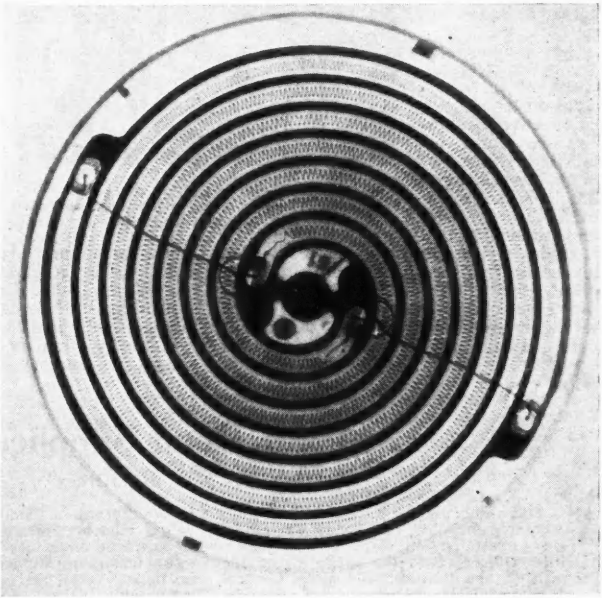


Fig. 4.—Radiograph of boiling plate as used in a domestic electric cooker; 10 min. at 120 kV, lead filter and lead screen

Examining Appliance Elements

One form of boiling plate used in domestic electric cookers consists of an iron casting containing grooves in which a spiral of nickel/chromium wire is wound and embedded in a refractory cement. The radiograph of such a boiling plate (fig. 4) taken at a tube voltage of 120 kV with a combination of lead filter and lead screen reveals the spacing of the wire element; the winding must remain undistorted if uneven heating of the plate surface is to be avoided. The examination cannot otherwise be carried out without destruction of the plate. Elements of the wire-wound type in kettles, domestic irons, and immersion water-heaters have also been examined in this way.

These examples mostly necessitate operation of the X-ray tube at or near its maximum working voltage, but in order to obtain results of maximum clarity and contrast it is a general rule to work at the lowest tube voltage compatible with reasonable penetration of the subject. Since the response of the X-ray photographic film is greater to the longer wavelengths, lower tube voltages are desirable from this point of view also. Below 100 kV filtration of the X-ray beam may be suitably carried out with molybdenum or copper. The thickness of lead effective at 150 kV is not required and would not only unnecessarily increase the photographic exposure time, but would probably reduce the contrast and so defeat the aim of the lower voltage. Glass-envelope thermionic valves are usually examined at 80 or 90 kV.

Voltages at the lower end of the scale are

employed to show defects in the cores of arc lamp carbons, which contain inorganic salts in addition to finely divided carbon, and so are radiographically revealed against the shell which contains no elements of high atomic weight. Since the whole carbon is of comparatively low density, 30 kV is sufficient to obtain optimum contrast and reveal the presence of defects in the core.

The examination of glass articles and refractory materials has also been carried out effectively. In a particular form of cathode-ray tube the neck of the glass bulb containing the screen enters the narrower glass tube holding the electrode system through a right-angled shoulder. The glass walls here must not spread into the path of the electrons, otherwise the scanning field will be interrupted and the image seriously obscured towards its edges. In some instances it has been required to check the dimensions of the glasswork after the completion of the cathode-ray tube. The radiograph (fig. 5) shows the region of the glass envelope in question sharply defined, thus allowing the thickness of the glass walls to be determined with reasonable accuracy.

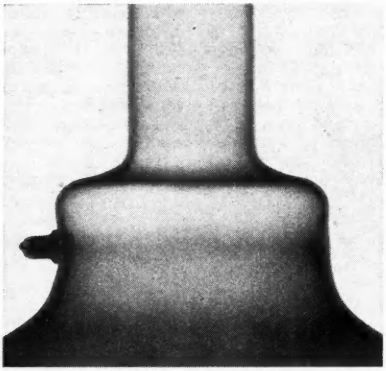


Fig. 5.—Radiograph of portion of cathode-ray tube glass envelope giving accurate measure of thickness of glass walls

In the blocks constituting the refractory linings of a glass melting tank, cavities or blow holes are sometimes found, more particularly in those cast from electrically fused material. Such faults are not usually detected by visual inspection of the block. Their presence may have serious consequences, since in regions where the cavities occur pieces of the refractory block are liable to break away and give rise to stones and inclusions in the glass products. Although the blocks are of comparatively large dimensions, of the order of 12 in. in thickness, they are composed largely of substances of low density, alumina and silica, and some success was obtained at 150 kV.

Canadian Metal Supplies

Opening Up New Resources

AN Order, setting up the Production Requirements Plan in Canada was issued on August 1st, by Mr. W. E. Uren, Priorities Officer, with the approval of the chairman of the Wartime Industries Control Board, states *Electrical News and Engineering* (Toronto). The Order establishes definite quotas for all manufacturers who use more than $5,000 worth of metals in a calendar quarter, and calls for a report for each quarter from every manufacturer. In this report must be stated the manufacturer's existing inventory, what he uses the materials for, and how much he will need for the subsequent three months. Calculations based on early reports received from manufacturers applying under the Plan indicate that the shortage of metals in North America is becoming so serious that still more drastic civilian curtailments must be made if war plants are to be kept in full operation. Hon. C. D. Howe, Minister of Munitions and Supply, stated recently that the demand for many kinds of metals far exceeded the supply.

It is pleasing to read in the same journal, however, that some success is attending the efforts made to open up new sources of supply of important metals. Tungsten deposits in the Emerald group of claims, eight miles south of Salmo, have been described by the Provincial Department of Mines as "undoubtedly the most outstanding discovery in British Columbia in recent years and one which will be of inestimable value to Canada's war effort." Samples of molybdenite ore submitted to the Department last October revealed the presence of scheelite or tungsten. Preliminary examination was so encouraging that a crew of men were put to work. Other discoveries of tungsten were made by engineers of the Department in old workings of the Cariboo Hudson mine in the Barkerville area and in the gravels of McDougall Creek and western tributaries north of Beaton.

Tin Discovery

The Sullivan Mine, the world's biggest zinc-lead producer, has emerged in the past year in yet another role, that of tin producer. Presence of traces of tin in the ore was known, but a year ago at the concentrating plant whitish streaks in the flow of tailings in the concentration process were noticed. These were found to be cassiterite. Further experiments resulted in the production of 99 per cent. standard tin.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Coal and Competition

REFERRING to your editorial comments on the effect of increased coal prices on the respective prices of gas and electricity (*Electrical Review*, September 18th, p. 354), it is interesting to review the position having regard to both cost and selling prices.

If 10s. per ton increase in the cost of coal increases the cost of gas by 1½d. per therm and electricity by .062d. per kWh the increase for electricity, on the Ministry of Fuel equivalent of 20 kWh to 1 therm, is 1.24d. On the 1939 Fuel Order equivalent of 14 kWh to 1 therm, the increased cost is .838d. This confirms your suggestion that the electricity industry is not so badly affected by coal price increases as is the gas industry.

When we come to selling prices, we can certainly believe the writer in the *Gas Times* when he says that " A general increase in the price level of coal would increase the relative strength of electrical competition." For on 14d. per therm for gas an increase of 1½d. represents 10.7 per cent. and on a secondary rate for gas of 6.75d. per therm it represents 22 per cent. increase. On electricity at 5d. per kWh an increase of .062d. represents 1.24 per cent. and on a secondary rate of three-farthings per kWh it is 8.3 per cent.

London, E. A. W. H. S.

Electricity and Heating

I WAS pleased to see Mr. Hawkins' letter in your issue of September 11th, which I should like to amplify.

It is not generally realised that in an ordinary domestic coal fire approximately 20 per cent. only of the heat energy of the coal is available for heating a room, so that 1 lb. of coal of a value of 13,000 BThU will only give 2,600 BThU of useful heat. A kWh represents approximately 3,400 BThU, all of which is delivered in a room by an electric radiator as useful heat. At the generating station this might be produced by 1.1 lb. of coal, so that, allowing for a slight loss in distribution, 1 lb. of coal used in this way will deliver 0.89 kWh on a consumer's premises, which represents 3,026 BThU. These figures show that a 2-kW radiator in use for an hour represents a consumption of 2¼ lb. of coal at the generating station, which is a solid volume of nearly 50 cu. in., or a little under 3¾ in. cube.

From the point of view of coal economy, electricity obviously has the advantage in providing small quantities of heat when comparison is made between that provided by a 2-kW fire and that by a piece of coal 3¾ in. cube being added to a coal fire each hour. It must be remembered, however, that electricity is almost entirely the main source of power for the production of munitions and so domestic consumption must be kept within limits so as not to interfere with the national war effort.

Birmingham. E. A. REYNOLDS.

THE footnote to Mr. Hawkins' letter in your issue of September 11th, is interesting, but surely the cost of ¼ cwt. of coal, as compared with 50 kWh of electricity anywhere in the country is overlooked.

Salford. E. D. BILL.

Delta-Star Starting

I FULLY agree with your correspondent Mr. W. Acton (*Electrical Review*, September 4th). If his suggestion were adopted a saving in energy would definitely be the result.

Many years ago I adopted a system of running in " star " a " delta "-connected 35-HP motor coupled to a DC generator. During the day the generator was lightly loaded and the starter was left in the " star "-connected position. At night the generator was practically fully loaded and the starter was then switched to the " delta " position. As these machines were running seven days per week, 24 hours per day, the saving per annum in power consumption was considerable.

Birmingham. T. SIMMONS.

Fuel Economy

MY sympathy is more with Mr. J. Radcliffe's letter in your issue of September 11th than with your comments, for coal is not renewable revenue, but irreplaceable natural capital, yet it is being consumed without any thought for future generations.

Therefore we should substitute for coal (and also natural oils) wherever possible other forms of power which may be available. Probably one of the most reliable estimates of the length of time our coal will last was that given by Mr. Forster Brown, about three years ago, in his presidential address to the Institute of Mining Engineers, when he stated (in short) that the *workable* coal in this country would not last a century.

Coal, of course, is only a store of the sun's energy bottled up in the earth, and there is no reason why we should not try to reserve this store and endeavour to make better use of the direct solar energy we are constantly receiving. Professor S. Chapman, in the the Kelvin Lecture of 1941, stated that

although we received less than one-thousand-millionth of the sun's output, yet the earth's share of over 170 billion kW was not small. Professor A. C. G. Egerton, in his Thomas Hawksley Lecture in 1940, suggested that " as much power as possible should be derived from the riches that the sun showers on us continually—60,000 times as much as the energy we at present use—rather than by depleting our inherited store so fast."

Water power (from rain) so far is the only method developed to any extent for the use of the sun's revenue, although in a small way power alcohol from vegetation is being used, which has been shown to be inefficient.

Great Britain is in too northerly a latitude to make direct use of solar energy to any great extent and its water power (derived from the sun) is also not large, Canada having nearly fifty times and New Zealand (nearer our own size) two and a half times as much (Mr. W. T. Halcrow's lecture to the Institute of Metals, 1942). Yet Great Britain is favourably placed to use tidal power, first harnessing the Severn Estuary, for which plans have already been prepared.

Even with all our sources of power completely developed there will be barely sufficient for the heat, power and light required by an agricultural population, which would appear to necessitate the gradual transfer of the greater part of our manufacturing population to other parts of the Empire, thus enabling our coal to last for a few more generations. Research should also be simultaneously carried out, in the warmer parts of the Empire, on the more efficient and direct use of the energy received from the sun.

Bournemouth. B. S. HORNBY.

WITH reference to the leaderette in your issue of September 11th under the heading " Necessary Repairs," I should like to make a plea through your columns for improved facilities for the repair of electric kettles.

The relative inefficiency of using a hot plate to boil a kettle of water is apparent, but there appears to be no alternative when the electric kettle has broken down as, from diligent inquiries made, it seems that facilities for repair of broken elements are practically non-existent.

Cheadle Hulme, Cheshire. L. A. WILLIAMS.

[Many electricity supply undertakings have arrangements for repairing consumers' appliances. Those who have not should take the necessary steps. Advice on this matter is obtainable from the British Electrical Development Association.—*Editors, Electrical Review.*]

IN this company we have individually and collectively had our curse and our criticisms of the fuel economy drive, including the reasons which have made it necessary. Having done so, however, we are now trying to play our part and we would like through the courtesy of your correspondence columns, to propagate an idea which may appeal to some folk as being worth while.

We are comparing our fuel bills from now on with the corresponding quarters of 1941, and whatever monetary savings are brought about by the considerate and economical use of heating and lighting by the staff, we are proposing to send to the Red Cross, or some other organisation selected by the staff.

In this way each member of the staff is given direct incentive to practise a little self-denial. If other people agreed with this idea, we do not think it would be long before the half-a-million pound deficit of the Red Cross organisation would be eliminated.

*London, E.C.*4. J. MORTIMER HAWKINS,
Managing Director,
MORTIMER, GALL & CO., LTD.

Electrical Wholesalers

THE other day I needed some electric lamps of " X " brand and had a great deal of difficulty in finding a stockist.

Fortunately, in the window of a fairly large wholesaler in a provincial town I saw the " X " show card. On the counter was an " X " cut-out with a space to hold the price-lists. To my surprise, however, there was none of that make, but one each of two other competitive brands.

My opinion is that nearly all wholesalers are as slack as this particular one and therefore I think I am justified in neglecting the wholesalers in my sales efforts.

Banstead. JAMES W. KILBY.

Intensive Training Courses

IT is pleasing to record the successful conclusion of the first series of intensive courses of training, held at Loughborough College, under the Lord Hankey scheme.

Courses have been held in mechanical, electrical and production engineering, and the enrolment in each group has averaged twenty-five.

The success of the scheme can be measured by the fact that already a second series has been planned and a large number of applications has been received during the past week or two. This second series of courses at Loughborough will begin on Thursday, October 1st. Employers interested should write to me. W. BIRRELL,

Loughborough. *Registrar.*

Canadian High-power Station

The Dominion Government has authorised the Canadian Broadcasting Corporation to proceed as rapidly as possible with the erection of a high-power short-wave radio station at Sackville, N.B., at a cost of about $800,000.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT the Institute of Fuel's opening meeting of the session on October 13th, the Melchett Medal for 1942 awarded to **Dr. Arno Carl Fieldner,** Chief of the Fuels and Explosives Services of the United States Bureau of Mines, will be accepted on his behalf by a member of the U.S. Embassy. The Melchett Lecture entitled " The Analysis and Testing of Coal in Relation to its Properties and Utilisation " will be delivered in the form of a talking film by Dr. Fieldner. The meeting is being held in the Lecture Theatre of the Institution of Electrical Engineers, Savoy Place, W.C.2, commencing at 2.30 p.m., and members of other Institutions are invited to be present. A short presidential address will first be given by Mr. W. M. Selvey. Before the meeting (12.30 for 1 p.m.) there will be an informal luncheon at the Waldorf Hotel. Applications for tickets (10s. 6d.) should be made to the secretary of the Institute at 30, Bramham Gardens, S.W.5.

Mr. H. J. Allcock, M.Sc., M.I.E.E., M.I.Mech.E., production officer and former process manager of Callender's Cable & Construction Co., Ltd., has been appointed Director-General of Communications Equipment in the Ministry of Aircraft Production.

The Secretary of the Department of Scientific and Industrial Research informs us that the Lord President of the Council has appointed Sir Lawrence Bragg, O.B.E., M.C., D.Sc., F.R.S., Professor J. E. Lennard-Jones, Ph.D., D.Sc., F.R.S., Mr. A. McCance, D.Sc., and Sir Raymond Streat, C.B.E., to be members of the Advisory Council to the Committee of the Privy Council from October 1st. Dr. G. M. B. Dobson and Mr. S. K. Thornley will retire from the Council on September 30th.

The Ministry of Fuel and Power announces the award of Miners' Welfare National Scholarships for honours degree courses in electrical engineering to **Mr. J. S. Lawrence,** Bathgate, West Lothian; **Mr. J. Wade,** Blackhall Colliery, Co. Durham; and **Mr. G. L. R. Dawson,** Newbiggin-by-Sea, Northumberland.

Mr. F. H. Wynne retired from the position of Chief Inspector of Mines on September 20th, upon reaching the age limit. He is succeeded by **Mr. J. R. Felton,** who has been Deputy Chief Inspector since 1937.

Mr. A. T. Gillanders, whose retirement from Standard Telephones & Cables, Ltd., was reported in our issue of September 11th, will continue to serve as a director of the Union Cable Co., Ltd. Our note implied that he was also retiring from the latter company.

Mr. A. C. Warman, A.M.I.E.E., A.M.I.Mech.E., M.Inst.F., has been elected president of the Bristol Association of Engineers for 1942-43. Mr. Warman is chief electrical and assistant plant engineer to the St. Anne's Board Mill Co., Ltd., Bristol.

Mr. H. Stanier, A.R.P. Officer and hon. secretary of the Engineering Society, English Electric Co., Ltd., Stafford, was married on September 12th, to Miss Doris Irene Petford of Sutton Coldfield, Birmingham. A timepiece and cheque were presented to Mr. Stanier by Mr. J. W. C. Milligan (assistant to the general manager at Stafford) on behalf of friends of the Engineering Society and the company's civil defence organisation.

A *Reuter* message states that **Mr. Owen D. Young,** retired chairman, and **Mr. Gerard Swope,** former president of the General Electric Co., of New York, will return to their old positions for the duration of the war, as their successors, **Mr. P. Reed** and **Mr. C. Wilson,** are now working for the U.S. War Production Board.

Sir David Milne Watson, Bt., LL.D., D.L., has accepted the invitation of the Council to become President of the Junior Institution of Engineers for the 1942-43 session. **Lord Sempill,** A.F.C., F.R.Ae.S., the retiring President, will induct Sir David at a meeting to be held in the Institution Lecture Room on December 12th.

Miss G. L. Entwisle, A.M.I.E.E., has been re-elected president of the Women's Engineering Society, and **Miss A. G. Shaw,** chief supervisor of women and motion study investigator at the Metropolitan-Vickers Works, Trafford Park, has been elected a member of the Council.

Mr. H. E. Partridge, M.I.E.E., consulting engineer, of Edinburgh, has been appointed a member of the Scottish Fuel Economy Committee.

Obituary

Mr. A. Pickersgill.—It is with regret that we record the death of Mr. Albert Pickersgill, late electrical engineer and manager to the Spenborough Urban District Council. His death occurred on September 11th, at Rotherham, after a long illness, at the age of seventy-four. Mr. Pickersgill received his early training with Greenwood & Batley, of Leeds, and was subsequently appointed deputy electrical engineer to the Dewsbury Corporation. He was appointed engineer and manager to the old Cleckheaton U.D.C. in 1905, when electricity supply was in its early stages of development and was appointed engineer and manager to the enlarged Spenborough U.D.C. (incorporating the old Cleckheaton U.D.C. and other districts) in 1915. He took an active part in Mid-East England electricity supply circles up to the time of his retirement in March, 1938, being on the Area Committee of the E.D.A., and also for a time chairman of the Bulk Supply Sub-Committee of the I.M.E.A.

The late Mr. A. Pickersgill

Mr. G. C. Pearson.—The funeral took place at Charlton Cemetery on September 18th, of Mr. George C. Pearson, who for many years was chief engineer of Johnson & Phillips, Ltd. At the time of his retirement in 1930, Mr. Pearson had completed fifty years in the service of the company. He was responsible for many of its most successful designs, notably in cable-making plant and in picking-up and paying-out machinery for submarine cable ships, which are in use all over the world. The company was represented at the funeral service by Mr. G. Leslie Wates, chairman, Mr. H. J. Sheppard, managing director, Mr. C. Stewart, director and a large number of the Company's staff and workpeople.

Institution Activities

BESIDES the scholarships already announced by the Institution of Electrical Engineers, two more have been awarded, namely, a David Hughes scholarship (value £100 tenable for one year) to Mr. I. G. Hanna, of the Royal Technical College, Glasgow, and a Salomons scholarship (value £66 tenable for a period of one year) to Mr. T. M. Chorley, of Birmingham University.

The I.E.E. North-Western Centre (Manchester) opens its session on October 3rd, when Mr. L. H. A. Carr is to deliver his address as chairman. Arrangements for future meetings include lectures on " Telecommunications of the Future," by Dr. W. G. Radley on November 7th ; " The Electric Spark in Air," by Mr. J. M. Meek, on December 5th ; and " Standardisation as applied to Industrial Electrical Instruments," by Lieut.-Col. K. Edgcumbe, on January 23rd.

At the Western Centre (Bristol), October 12th has been fixed for the chairman's address by Mr. C. Culmer Hodges, and thereafter meetings will take place monthly.

* * *

An examination for the award of a Lloyd's Register scholarship in marine engineering, value £100 a year for three years and tenable at a British university, will be held on May 31st to June 4th, 1943. Candidates must be British subjects between the ages of 18 and 21 who have been employed in engineering, either as apprentices or as college students, with the intention of entering upon the profession of marine engineering, and have served at least two years in commercial engineering workshops. Apprentices in H.M. Dockyards are not eligible. Full particulars may be obtained by those interested from the secretary of the Institute of Marine Engineers, 73, Amersham Road, High Wycombe, Bucks.

* * *

The Institute of Industrial Administration has decided upon a modification in the grading of members. Hitherto there have been two " professional " classes—fellows and members, with the " non-professional " grades of graduate and student. The new classes will be fellows, members and associate members (corporate members) and associates, graduates and students (non-corporate members).

Forthcoming Events

Institution of Electrical Engineers.—Thursday, October 1st, 5.30 p.m. Inaugural address by the new President, Prof. C. L. Fortescue.

Wireless Section.—Wednesday, October 7th, 5.30 p.m. Dr. R. L. Smith-Rose's inaugural address.

Devon and Cornwall Sub-Centre.—Thursday, October 1st., 5 p.m. (tea, 4-30 p.m.). Royal Clarence Hotel, Exeter. Inaugural address by the new chairman, Mr. A. E. Baker.

South Midland Students' Section.—Thursday, October 1st, 6.30 p.m. (tea 6 p.m.). James Watt Memorial Institute, Birmingham. Chairman's address by Mr. W. E. Deaman on " A Technical View of Modern Production."

North-Western Centre.—Saturday, October 3rd. Manchester. Chairman's address by Mr. L. H. A. Carr.

British Institution of Radio Engineers.—*London Section.*—Friday, September 25th, 6.30 p.m. F.B.I., 21, Tothill Street, S.W.1. Address by the President, Sir Louis Sterling, and paper on " Aspects of Modulation Systems," by Dr. J. Robinson, M.B.E., M.I.E.E.

Birmingham Electric Club.—Monday, September 28th, 5 p.m. Grand Hotel. Reunion. 5.45 p.m. Paper on " The Choice, Operation and Maintenance of Power Transformers," by Mr. E. T. Norris, M.I.E.E. Those wishing to attend the tea should notify the secretary, Mr. J. E. Oakley, 200, Streetly Road, Birmingham 23.

Electrodepositors' Technical Society.—*Birmingham.*—Tuesday, October 6th, 6 p.m. " Recent Developments in Metal Rectifiers as applied to Electrodeposition," by Mr. D. Ashby, B.Sc., A.M.I.E.E., A.M.I.Mech.E.

Institution of Mechanical Engineers.—Friday, October 9th, 5.30 p.m. Storey's Gate, S.W.1. Informal meeting on " The Training Activities of the Ministry of Labour," to be introduced by Mr. E. Watson Smyth.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, October 16th. Bolbec Hall, Newcastle-upon-Tyne. Presidential address by Mr. J. Ramsay Gebbie, B.Sc.

New Swedish Power Stations

THE Kattstrupeforsen hydro-electric power station, one of the biggest in Sweden, was inaugurated on August 31st. The station, which is situated, like so many other Swedish power stations, on the Indalsälven river in North Sweden, has two sets of turbines and generators with a total capacity of 40,000 kW. Construction began in February, 1940. In October, 1941, the first set had been completed, and in March this year the second set was ready. The cost of the plant was 15.5 million kr.

A private power producing company, Voxnans Kraftaktiebolag, has applied for a licence to build a hydro-electric power station on the Ljushnan river in North Sweden, in order to harness the Malvik and Alfta rapids. The cost of the plant is estimated at 6 million kr. The station would be of 16,500 kW capacity.—*Reuter's Trade Service* (Stockholm).

COMMERCE and INDUSTRY

Workers' Clothing Coupons. Scrap Metal Order.

Young Electricians' Wages

IT was recently reported that youths under twenty-one years of age employed in the electrical contracting industry had been divided into three categories. Now it is announced that those in Category II who are receiving higher rates of pay than those specified shall continue to do so while they remain with the same employer. Youths in Category III are to continue to receive any higher wages which they may be paid above the specified amounts while the agreement remains in force.

Category II comprises boys who are in effect non-indentured apprentices while those in Category III are "casual" boys.

Rubber Boots for Electricians

The Board of Trade has intimated its willingness, in certain cases and subject to certain conditions, to provide employers with the necessary coupons for the purchase of rubber boots. In notifying members of the National Federated Electrical Association (E.C.A.) of the Board's decision, the Director and Secretary (Mr. L. C. Penwill) points out that in view of their scarcity rubber boots should be kept in good repair and only used where they are indispensable. Before coupons are issued to him an employer must undertake responsibility for the proper use and maintenance of the boots. They must not be issued for the exclusive use of individuals and must only be used for the particular jobs in respect of which buying permits have been granted.

Clothing Coupon Concession

Millions of industrial workers will benefit by the award made by the Board of Trade of ten extra clothing coupons for the 1942-43 rationing period. These will be issued through the Ministry of Labour and National Service in the form of supplementary coupon sheets (S.C. 5A) containing ten coupons each. Fifty trades and occupations are affected, and the list includes the following :—Production and treatment of metals; manufacture of metal products and of goods wholly or mainly of metal; general marine and constructional engineering; electrical engineering, wiring, contracting and installation; manufacture and maintenance of electrical goods and equipment, including radio; manufacture of rubber and rubber goods and synthetic and synthetic rubber goods; building and contracting, including the construction, maintenance repair, etc. of buildings, roads, trolley-bus routes, tramways, railways, etc.; operation of locomotives, trains, buses, coaches, trolley-buses, trams and road goods vehicles, etc.; gas, water, electricity and hydraulic power supply, sewerage and telecommunications; works and plant and laboratory chemists and their assistants and laboratory workers; and workers engaged on installation, maintenance or dismantling of electrical installations and industrial or agricultural plant and machinery.

The full list is given in a leaflet (G.O.S.10) which is available for display on works notice boards. The worker who is eligible must get a claim form (E.D. 277) from his trade union or his employer. He must fill it in and return it to his employer, who will make a collective application (on form E.D. 279) on behalf of the claimants and distribute the coupons when he receives them. The self-employed worker should obtain Form E.D. 278 from his nearest employment exchange and return it to that exchange when he has completed it. Part-time workers are eligible, provided they average at least 22 hours a week. All application forms (E.D. 278 and 279) must be completed and in the hands of the local offices of the Ministry of Labour before October 31st next. Arrangements are made for workers who enter any of the specified employments at a later date.

Arc-Welding Plant

At the request of the Directorate of Industrial Electrical Equipment a new War Emergency British Standard (No. 1071) has been issued to provide for the AC equipment which is required for the increasing application of welding to shipbuilding and other similar heavy constructional work. It is based on B.S.638 and will be quoted by Government Departments in their contracts. Copies are obtainable from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 1s. 3d. post free.

Welding Economy

The Ministry of Supply has produced a poster for display in arc welding shops to encourage arc welders to assist in speeding up production and saving material. The poster combines the purposes of preventing waste and increasing output, and includes such phrases as "We don't waste stub ends"; "We use larger electrodes"; and "We use higher currents." Copies of the poster can be obtained from the Advisory Service on Welding, Berkeley Court, Glentworth Street, London, N.W.1.

Stricter Control of Paper

The Control of Paper (No. 36) Order, 1941, which placed severe restrictions upon the use of paper for directories, advertising, packing and many other purposes has been replaced by a new Order (No. 48, S.R. & O. 1942 No. 1817; Stationery Office, 3d.) which imposes a still stricter control.

It places a complete ban, *inter alia*, on the production of posters (other than those relating to sales by auction and bills of fare for "self service" restaurants); on window bills, showcards and display cards exceeding 100 sq. in. in area not printed or made before September 14th; on posters exceeding 1,200 sq. in. in area not printed or made before November 12th, 1941; on advertising novelties, counter display and window display devices; on dummy cartons and on calendars weighing more than 2 oz.

The distribution of any advertising circular is prohibited unless it was printed before November 12th, 1941, and is distributed before November 1st, 1942; or is distributed to a person who pays

before such distribution at least one penny for that circular; or comes within certain classes including circulars relating to the sale of used industrial plant, machinery and equipment and price lists (with or without specifications) dispatched to wholesalers or retailers of the goods advertised therein. The gratuitous distribution of circulars of the last mentioned classes, however, is also prohibited unless the distributor gratuitously distributed circulars of the same description during the year ended August 31st, 1939, and unless the aggregate weight of advertising circulars distributed in any period of three consecutive calendar months does not exceed three-twentieths of the weight distributed during the year ended August 31st, 1939.

The foregoing does not prohibit or restrict the distribution of catalogues or specifications relating to industrial or laboratory plant, machinery and equipment or particulars of educational courses. The term "advertising circular" means "anything composed of or containing paper and distributed in substantially identical form to more than 12 persons for purposes of advertising."

Restrictions are placed on the use of paper for wrapping. It is stipulated that it shall only be employed when it is necessary for protection and then shall not be of a greater "substance or caliper" than is sufficient for the purpose.

Apart from the restrictions mentioned the Order lays down regulations for many other uses of paper with a view to ensuring that no more is used than is reasonably necessary for any purpose.

Limitation of Supplies Amendment

An amending Order to the Limitation of Supplies (Miscellaneous) (No. 16) Order (S.R. & O. 1942 No. 1510) has now been issued and effects two important changes, namely: (1) Controlled goods used in the production of uncontrolled goods are again subject to quota restrictions as in the previous Miscellaneous Orders. (2) Small manufacturers, whose quotas now fall below the £100 a month limit allowed to unregistered manufacturers, may increase their supplies without incurring any liability to prosecution, provided that all their supplies to all persons are not more than £100 a month.

Any small manufacturers who decide to supply in excess of quota but to keep their total supplies within the £100 a month limit, must send before February 7th, 1942, written notification that they have done so to the Board of Trade, I. & M. 4 Department, Millbank, London, S.W.1. Inquiries about the Order should also be sent to this address.

The new Order, the Limitation of Supplies (Miscellaneous) (No. 17) Order, 1942 (S.R.& O. 1942, No. 1842) is obtainable from the Stationery Office, price 1d.

Disclosure of Scrap Metal

The Minister of Works and Planning has made an Order, S.R. & O. 1942, No. 1723, under which occupiers of all premises in England, Scotland and Wales at which there are three or more tons of metal suitable for scrap must inform the Ministry of Works and Planning within thirty days of September 21st, 1942. Returns must also be made within thirty days of any subsequent day on which such an amount of metal is so accumulated. Metal is deemed suitable for scrap if it is any metal—ferrous or non-ferrous, other than aluminium or magnesium or their alloys—which is, or forms part of, any building, structure, plant or article which is disused, obsolete or redundant, or otherwise serving no useful purpose. The information must be made on a prescribed form, which may be obtained from "Scrap Recovery," Ministry of Works and Planning, Sanctuary Buildings, Great Smith Street, London, S.W.1.

This Order is an extension of the Order (S.R. & O. 1942 No. 761) made on May 14th, 1942, calling for an identical return from premises in certain areas. If a return has already been made from premises in these areas another return need not be made.

Returns are not required where the metal forms part of those machine tools specified in the first schedules to the Control of Machine Tools (No. 9) Order and the Control of Machine Tools (Cutting Tools) (No. 1) Order, 1942, or in any Orders replacing or amending them; or where returns have already been made to the Iron and Steel Control under the Industry (Records and Information) (No. 1) Order, 1940, or (No. 2) Order, 1941; or where the metal forms part of standby plant or equipment held by public utility undertakings and which is essential for the performance of the statutory obligations of those undertakings, or which is held by them for the purposes of Sections 40, 42, 59 or 60 of the Civil Defence Act, 1939.

American Lighting Conference

The annual conference of the American Illuminating Engineering Society has just been held in St. Louis, Missouri. With the industry of the United States on a war footing the conference has naturally concentrated on lighting as it affects wartime production, and the first day of the conference was devoted to this aspect of illumination, and such matters as lighting recommendations, with particular reference to the war industries, and protection against sabotage were discussed. The first part of the second day was given over to the question of the application of cold-cathode sources to interior lighting; photometric procedures and data on visibility of reflex reflectors; and luminescent paints and materials useful in the war effort. The final session was taken over by the Defence Committee which presented a symposium on "black-outs" and "dim-outs."

Further Lamp Publicity

An interesting feature of the lamp publicity campaign of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., is to be an attractive series of advertisements associating "Cosmos" lamps with the subject of cosmology by diagrams and notes on some of the principal constellations. Considering how often we see the night sky, especially clear under black-out conditions, it is strange how little most people know of the cyclic changes of its pattern. This interesting series of notes may well constitute an introduction to the study of elementary astronomy.

Although under the present restriction of paper supplies the company is not producing any new showcards this season, some stocks of existing showcards are still available and are being used in window displays where these can be arranged. The company's new publications

are in wartime folder form. One of these, "Metrovick 'Cosmos' Lamps," gives specification particulars, including dimensions and prices of "Metrovick" discharge lamps and "Cosmos" lamps of all types. Another folder, "Metrovick Industrial Fittings," gives particulars of reflectors, including simple troughs and the company's patented system of continuous troughing for use with tubular lamps and control gear for discharge lamps. A third folder is devoted to mains voltage 5ft. fluorescent tubular lamps and fittings.

With a view to assisting in the campaign for fuel economy the advertisements will incorporate the advice to "Use Less Light and Use it Well."

Limited supplies of an attractive price list are being distributed to the trade by CRYSELCO, LTD. This list is printed in colour and contains particulars of all standard lamp types. There is also a cycle lamp price list, in colour, giving details of lamps in general demand for the various makes of cycle dynamo sets. Two showcards are being issued. The one relating to standard lamps has an attractive frontispiece design and on the reverse side, for handy reference, a full range of lamps available will be incorporated; in addition there is a panel giving particulars of the purchase tax applicable. The other showcard refers to cycle lamps, and like the first-mentioned card has an effective frontispiece, with details of the lamps available shown on the reverse side. In the accompanying illustration we show a cut-out, a limited quantity of which is being distributed by the company.

A Cryselco lamp display cut-out

Purchase Tax Notices

The Commissioners of Customs and Excise have issued Public Notice No. 78 which supersedes the Notice of the same number issued in September, 1941, Notice No. 81 and all subsequent additions and amendments up to September 15th, 1942. This contains details of the goods chargeable with Purchase Tax with full explanatory notes.

Public Notice No. 79A, also just issued, explains that where maximum prices have been fixed for goods by Orders or Directions made by the Board of Trade the value of the goods on which Purchase Tax is payable and the maximum price fixed by the Order or Direction are entirely distinct and unrelated. The value determined in accordance with the instructions of the Commissioners of Customs and Excise is relevant only for determining the amount of tax payable and has no bearing on the price which may be charged for the goods. In some cases the value for Purchase Tax purposes will be higher than the maximum price at which the trader who accounts for the tax may legally sell the goods. In such cases he must not sell at the Purchase Tax value, but at a price not exceeding the legal maximum price as laid down in the relevant Order or Direction and the incidence of the Purchase Tax valuation will not be accepted as an excuse for contravention of maximum price Orders.

These Notices are now being circulated to all traders registered for Purchase Tax.

Export Control

As from September 28th licences will be required for the export of metal filaments for electric lamps and wire spirals, whether coiled or not, wholly or mainly of molybdenum or tungsten. The Order, Export of Goods (Control) (No. 38) Order, 1942 (Stationery Office, price 1d.) also covers certain synthetic resin and casein products; ball and roller bearings and parts; and plummer blocks, brackets, hinges and pedestals incorporating such bearings.

Visual Indicator Lamps

At the request of the General Post Office there has been issued a specification for visual indicator lamps for use on telephone and telegraph switchboards and allied purposes (B.S. No. 1050/1942), which is in the usual form of lamp specifications.

Four types of lamps are specified. It is stated that for 4-V and 6-V lamps a single-coil filament without intermediate supports is satisfactory, while for 12-V, which is required to give negligible illumination at 4 V, a single-coil filament with one intermediate support is satisfactory. A similar type of lamp with one intermediate support is also satisfactory for the 24-V lamp. These lamps may be conveniently tested in a lamp jack and the appendix describes a suitable form of lamp jack and extractor. Copies may be obtained from the British Standards Institution, 28, Victoria Street, Westminster, S.W.1, price 2s. 3d., post free.

Cored Solder

A tin economy revision slip, P.D.21, has been issued for B.S. 441 which specifies that the grade of solders used in cored solders should conform to one of the five grades covered by the War Emergency British Standard No. 219. In order to provide for the possibility of even less tin being used a qualification is included to state that by agreement other alloys may be employed. The opportunity has also been taken to extend the scope of the specification to include multicore solders and to modify the requirements as to the composition of the resin used for filling the core. Copies of this amendment slip may be obtained from the British Standards Institution, gratis, on receipt of a stamped addressed envelope.

Method of Welding Magnesium

The development of a method of welding magnesium, thus making available for aircraft manufacture one of the most abundant metals known, is reported by Northrop Aircraft, California. While magnesium has been used widely in engines, wheels and accessories, fabricating difficulties have prevented development for primary construction. Announcement of the discovery was made by Mr. T. H. Piper, Northrop process engineer, in an address prepared for the American Welding Society. He said that the

method had made available to aircraft manufacturers the same savings in time and cost which had been experienced in welded ship construction.

Rubber Control

Restrictions upon the production of conveyor, elevator, transmission and certain types of special belting containing rubber are imposed by the Control of Rubber (No. 16) Order, 1942 (S.R. & O. 1942 No. 1829, price 2d.). The proportion of new rubber in permitted types of belting is specified.

The No. 17 Order (S.R. & O. 1942 No. 1830, price 3d.) places restrictions on the production of hose containing more than a certain proportion of rubber.

Fuel Economy Campaign

A " Battle for Fuel " exhibition was opened at the Charing Cross Underground station on Monday by Commander S. King-Hall, chairman of the Fuel Economy Committee of the Ministry of Fuel and Power. In his speech Commander King-Hall said that at present there was a difference between the production and consumption of coal of 250,000 tons a week on the wrong side. That gap had to be bridged and the first indications of the results of the economy campaign had not been discouraging.

Major Lloyd George, the Minister of Fuel and Power, opened a similar exhibition at Birmingham on the same day. He said that the people of this country were alive to the need for saving fuel, but it was the Government's duty to show them how they could do it.

A.T.S. Electricians

Three months' training as electricians for members of the Auxiliary Territorial Service has been commenced at a London technical college. Upon completing the course the women will be posted to the Royal Electrical and Mechanical Engineers.

Generating Plant Destroyed

It is reported by the Belgian news agency Inbel, that alternators ready for dispatch to Norway have been destroyed in an explosion caused by saboteurs at the A.C.E.C. works at Charleroi.

Trade Announcement

We are informed that sales of the new varnish insulating process originated by Lewis Berger & Sons, Ltd., and at present handled by their associated company, Sir W. A. Rose & Co., Ltd., under the trade name " Swarc," will in future be dealt with by Lewis Berger & Sons, Ltd., under the Berger trade name " Hy-Meg " insulating products. The technical and service staffs concerned in the original production will continue to be responsible for the development and servicing of the " Hy-Meg " process and products.

Change of Address

The Easco Electrical Service has removed to 6 & 8, Brighton Terrace, London, S.W.9 (telephone: Brixton 4961/2).

TRADE MARK APPLICATIONS

RECENT applications for British trade marks include the following, objections to any of which may be entered within a month of the dates mentioned :—

September 9th.

LECLAD. No. 617,020, Class 9. Electric cables, wires (other than lead-covered wires), junction boxes and casings, switches, fuse boxes, flat-irons and conduits.—Liverpool Electric Cable Co., Ltd., 24, Queen Anne's Gate, Westminster, London, S.W.1.

BUSY BEE (design). No. 618,642, Class 9. Electric accumulators and batteries, bells, buzzers, wireless apparatus, television sets, gramophones, sound receiving and recording instruments, etc. Also No. 618,643, Class 11. Electric lamps, bulbs and torches.—Price & Co. (Manchester), Ltd., 78 and 80, Tib Street, Manchester, 4.

September 16th.

ELKONITE. No. 619,577. Class 9. Electrodes for electric welding. Mallory Metallurgical Products, Ltd., 78, Hatton Garden, London, E.C.1. (To be associated with No. 617,267 (3349) ix. Registration No. 618,061 (3342) ix will be cancelled if and before the applicants' mark is registered).

DURATWINFLAT. No. 619,594. Class 9. Twin core flat electrical cable. (To be associated with No. 619,597 (3364) ix and others). DURATHREEFLEX. No. 619,595. Class 9. Electric triple flex. (To be associated with 619,596 (3364) ix and others). DURATHREEFLAT. No. 619,596. Class 9. Triple core flat electrical cable. (To be associated with 619,595 (3364) ix and others). DURATWINFLEX. No. 619,597. Class 9. Electric twin flex. (To be associated with No. 619,594 (3364) ix and others).—Duratube & Wire, Ltd., 16, Hanworth Road, Feltham, Middlesex.

POLYKOL. No. 618,726. Class 17. Materials for electrical insulation.—Ward & Goldstone, Ltd., 107, Frederick Road, Pendleton, Manchester, 6.

LUNEFLEX. No. 619,046. Class 17. Tubing for electrical insulation coated or impregnated with cellulose, casein or synthetic-resin plastics. —Jas. Williamson & Son, Ltd., Lune Mills, New Quay, Lancaster.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following :—

STANDARD vacuum cleaner (formerly D. Bates & Co., Ltd.)

CLIMAX resistance wire.

Local Fuel Campaigns

Plans for Country-wide Exhibitions

TO back up the national fuel economy appeal local authorities throughout the country are being asked to organise "Battle for Fuel" campaigns in their areas. A booklet outlining the suggested procedure has been prepared by the Ministry of Information in co-operation with the Ministry of Fuel and Power, and with the assistance of the British Electrical Development Association, the British Commercial Gas Association and the Coal Utilisation Joint Council.

Copies of the booklet, together with a letter from Commander Stephen King-Hall, M.P., Director of Publicity, Ministry of Fuel and Power, are being sent to the civic heads of all boroughs and urban districts with populations of not less than 10,000, and by E.D.A. to all electricity supply undertakings.

In his letter, Commander Stephen King-Hall says that it is his desire to open up with the least possible delay locally inspired and organised fuel economy "battles" in as many parts of the country as possible in order to refresh and stimulate the forward drive started by the national campaign.

The plans for these local drives are based on the first experimental campaign held recently at Guildford, which produced many inquiries and requests for assistance from towns all over the country.

Materials Available

It is suggested that the central feature should be a fuel economy exhibition or demonstration, and for this purpose the necessary materials have been carefully prepared and assembled and are offered free of charge. These materials include many interesting exhibition units, for example, panels explaining how to read electricity and gas meters and a series entitled "How the Smith Family learned to Save Fuel," which comprises a series of 24 panels dealing with every aspect of fuel economy. Banners, flags, posters, window stickers, a four-page leaflet, cinema slides, window displays and advertising blocks are also available. In addition, the use of the Ministry of Information's loudspeaker cars is offered in certain circumstances ; it is pointed out, however, that the limited fleet of cars attached to regional offices is usually heavily booked in advance.

The exhibition would, of course, include a fuel advice bureau, and in this connection the desirability of permanent bureaux of this kind being set up in every town of suitable size is stressed.

Apart from the local campaigns a small fuel economy exhibition is touring the country on the Ministry of Information's retail display circuit between now and December, and dates are given when the exhibition will be held at stores in thirty-five localities. This touring exhibition may be used as the nucleus of the larger local exhibition, or it may serve the purpose of a follow-up to the civic campaign.

Requisition forms for exhibition materials are returnable to the Director of Publicity of the Ministry of Fuel and Power, but further advice and guidance may be obtained from E.D.A.

On September 11th, Mr. J. Harwood Lumsden (chief engineer, S.H.M.D. Board), as chairman of the E.D.A. North West England and North Wales Area Committee, presided over a gathering at the Central Library, Manchester, of some 150 chairmen, members of Electricity Committees, chief engineers and members of staffs of 70 electricity supply undertakings in the area. The subject of "Fuel Economy" was dealt with by Mr. V. W. Dale (business manager, E.D.A.) who is a member of the Fuel Economy Publicity Committee of the Ministry of Fuel and Power. The conference was the first of its kind to be organised by the Association and was attended by Mr. Gordon Macdonald, Regional Fuel Controller for the North West Region.

New Zealand Notes

WORK on the Lake Tekapo hydro-electric scheme, begun in 1940, has been suspended, states the *New Zealand Electrical Journal*. This is in accordance with the Government's policy of transferring all available plant and men to urgent defence works. The closing down of the scheme, the Minister of Public Works stated, would have a decided effect on the power available in future years until work on it could be resumed. The power shortage in the South Island, however, was not nearly so big a problem as in the North Island.

A statement by the Public Works Department covering the year ended March 31st, 1941, reveals that there was an increase in the demand for power from the Government and Government-controlled generating stations of 13.9 per cent. in the North Island and 13.4 per cent. in the South Island. Altogether 1,830 million kWh was generated and 1,448 million kWh sold. The number of consumers at the end of the year was 442,222, who thus had an average consumption of 2,981 kWh. Per inhabitant, the average worked out at 917 kWh. The installed capacity of the main stations was 338,075 kW and the total connected load was 2,388,389 kW.

The 1941-42 accounts of the Christchurch Electricity Department show a credit balance on the operating and trading accounts of £39,107 ; this compares with £11,277 in the previous year. The improvement was due to a rise in revenue from £340,449 to £347,932 while the cost of power (£182,933) remained practically stationary and working expenses dropped from £84,043 to £74,128. Although the cost of power did not rise sales of electricity, at 112.4 million kWh, were 5 million kWh more than in the previous year and the m.d. advanced from 32,744 kW to 33,110 kW.

The total revenue of the Wellington Electricity Department was £450,556, a decrease of £14,756 on the previous year. Working expenses, capital charges and appropriations were £8,647 higher at £427,096, and the net profit for the year was £23,460 against £46,863.

Overhead Line Regulations

Further Relaxations to Secure Economy

WITH a view to securing economies in the use of materials for overhead lines, the Electricity Commissioners are proposing modifications to their Overhead Line Regulations, 1931 (El. C. revised) for application except where climatic conditions are unduly severe.

In the first place, unnecessarily large margins of current-carrying capacity should not be allowed for lines erected for meeting purely war-time demands. Authorisation will be given only in special circumstances for the acquisition of iron and steel for supports; approved designs of wood and reinforced-concrete supports must be used to the maximum.

These modifications will apply to high-voltage lines with conductors ranging from No. 8 SWG (Reg. 3) up to 0.04 sq. in. of copper or copper equivalent. The factor of safety (Reg. 6 &7) of pinewood supports is to be 2.5 instead of 3.5. Home-grown wood poles may have a factor of safety of 3.5 for permanent lines, but for temporary or less important lines the minimum will be 2.5 instead of 3.5. For approved reinforced concrete poles, the figure will be 2 and not 3.5. Wood poles are to be not less than 7 in. in diameter at 5 ft. from the butt end.

Wind pressure on supports need not be regarded where the loading on the conductors is calculated as follows. The factor of safety for line conductors (Reg. 15) must not be less than 2.5 based on breaking load and on the assumption that the temperature of the line conductor is 22 deg. F. without ice loading and that the wind pressure is equivalent to 16 lb. per sq. ft. on the whole of the projected area of the conductors.

The minimum height of conductors from the ground is to be 17 ft. at any point on the span at 122 deg. F. and for voltages up to 33 kV. At road crossings, however, the height must still conform to Reg. 16. The continuous earth wire and the earthing of metal on wood supports (Reg. 17) will be omitted, provided that such metal is efficiently bonded and that on transformer poles it is earthed. At road crossings, insulators, bridles, clamps and earth bars will be omitted, provided that the line conductors are satisfactorily bound to their insulators, e.g., by a stirrup-type binding, and that the insulators are of the next higher rating to that recommended in Table II of B.S.S. 137/1941, for the appropriate line voltage. Where the lines cross or are in proximity to Post Office circuits, they must still comply with the requirements of P.O. Memorandum 231A.

For other high-voltage lines with conductors from 0.5 sq. in. upwards, the modifications regarding minimum height, earthing of metal work on poles and road crossings may be applied, but in all other respects such lines must comply with the Overhead Line Regulations.

Undertakings erecting overhead lines of any modified design should state this in their application for consent to the Ministry of Fuel and Power, together with particulars as to the size and minimum height of conductors, size of poles and factors of safety.

I.M.E.A. Notes

MEMBERS of the Incorporated Municipal Electrical Association considered at a recent meeting draft heads of an agreement dealing with wartime arrangements relating to generating stations operating under the direction of the Central Electricity Board. The underlying purpose was to ensure that the onus of war damage to plant by enemy action should not fall solely upon undertakings affected but should be spread in an equitable manner. Various amendments, mainly for the purpose of clarification, were suggested and agreed to and the draft has now been approved by the Council of the I.M.E.A.

Testing R.A.F. Instruments

Certain supply undertakings have been asked to co-operate with the Royal Air Force by testing measuring instruments and where necessary carrying out minor repairs and calibration.

The matter has been considered by the Joint Committee of Electricity Supply Associations, and it has been agreed that undertakings would be willing to undertake the work provided a reasonable sum were paid to cover supervision and other overhead expenses. It was recommended that the charge made for this service should be the actual cost plus a maximum of 25 per cent.

It was stated that in the main very little repair work was likely to be required and the proposals were therefore confined to the use of standard instruments owned by undertakings for calibration purposes.

Wear and Tear Allowances

After further discussion between the Inland Revenue authorities and representatives of electricity supply associations the former have suggested for consideration that instead of an all-round increase of 2½ per cent. upon the existing rate of 6¼ per cent. in respect of wear and tear allowances for generating plant, a rate of 8 per cent., plus the additional 20 per cent. provided for by the Finance Act, 1938, making a total of 9.6 per cent., would be more justifiable. It is proposed that the rate should operate for the years 1941-2, 1942-3 and 1943-4.

The Board of Inland Revenue has agreed to allow electricity undertakings 3 per cent. on the written down value of lamp standards and 12½ per cent. on lamp controllers and gear as wear and tear allowances where the equipment is provided by the undertakings. These allowances take the place of the expenditure on renewals hitherto allowed as and when incurred. Expenditure on the connection of lamp columns and the renewal of electric lamps will be allowed. Contributions towards the cost of services must be shown as a revenue credit for taxation purposes.

ELECTRICITY SUPPLY

Two-part or Flat Rates?

Aylesbury.—SUSPENSION OF MINIMUM CHARGE.—In view of the extreme importance of fuel economy, the Council has agreed, as a temporary measure during the Fuel Economy Campaign, to cancel the fixed minimum charge amounting to 7s. per quarter payable by consumers under the standard electricity tariff. The suspension takes effect from the next quarterly meter readings.

Bristol.—LOAN.—The Electricity Committee is seeking sanction to borrow £31,570 for various purposes.

East Grinstead.—WATER-HEATING CHARGES.—At a recent meeting of the Urban District Council it was reported that the Electricity Commissioners considered that the question of revising the electricity tariff relating to water heaters should be deferred until the Council could ascertain the effect on the undertaking of any additional burden in respect of coal.

ECONOMY AND ALL-IN TARIFF.—With regard to the question of changing from the all-in tariff to flat rates, the treasurer reported that in many cases it had been found on investigation that such a change, applied for in view of reduced consumption, would result in higher bills. He suggested that consumers should consult the Electricity Department before deciding to change over.

Epsom and Ewell.—PRICE REDUCTION.—It is reported that the Council has authorised a reduction of 5 per cent. in electricity charges from October 1st. Originally there was a war-time addition of 25 per cent. which was subsequently reduced to 16⅔ per cent., and in March last further lowered to 10 per cent.

Isle of Man.—UNECONOMIC RURAL ELECTRIFICATION.—The annual report for 1941–42 of the Electricity Board describes the electrification of farmhouses in thinly populated areas as almost impossible financially. Such supplies can only be provided, it is stated, if the consumer is prepared to make a considerable contribution towards the capital cost and to guarantee an annual consumption that will cover the transmission and transformer losses. The *Isle of Man Times* comments that the Board does not mention the alternative of a Government subsidy suggested during a recent election campaign when the question was raised.

The Board's report states that during the year under review the number of consumers rose from 4,408 to 4,593 and the sales of electricity increased from 4·3 million to 5·9 million kWh.

Oldham.—RENOVATING COOKING UTENSILS.—The Electricity Committee has decided to install plant for renovating tins and utensils used in connection with electric cooking equipment.

Taunton.—TRANSFER TO FLAT RATES.—Consumers who for at least four quarters have been taking a supply of electricity under the two-part tariff are to be allowed to transfer to flat rates, subject to certain conditions, if they consider it would be advantageous to them as a result of economising in consumption. Where application is not made before September 30th, the terms of the two-part tariff agreement will continue to operate.

Irish Restrictions Relaxed.

Overseas

Eire.—RATIONING RELAXED.—The Electricity Supply Board has just announced that owing to the greatly increased flow of the Shannon—there was a rise of over seven inches in the water level in a week, causing flooding in places—the restrictions placed on electricity consumption have been modified. Until further notice consumption will be limited to the average daily amount in the corresponding period of last year without regard to the purpose for which electricity is used. This relaxation is a temporary one, amending the Order made last May which banned the use of electric fires and heaters, limited the amount of electricity used for cooking to the corresponding consumption in the previous year and imposed cuts of 50 per cent. on water heating supplies, 10 per cent. on motive power and 25 per cent. on supplies for all other purposes.

India.—EMERGENCY POWERS.—The Punjab Electricity (Emergency Powers) Act, 1941, which has received the assent of the Governor-General, empowers the Provincial Government to assume possession and control of any public electricity service for a period not exceeding two years when it appears to the Government that there is any likelihood of a failure in the continuous supply of the service or diminution of such supply to the public disadvantage.

United States.—ELEVENTH UNIT AT BOULDER DAM.—According to *Electrical West*, Boulder power house became unquestionably the largest hydro-electric generating plant in the world when the eleventh unit, an 82,500-kW machine designated as A-2, went into service July 13th, making the installed capacity 869,800 kW. Two more such units are on order, A-5 scheduled for operation in November, and N-7, ordered last December. At some time in 1945 Grand Coulee will supersede Boulder as the world's largest power house. The two 75,000-kW Shasta machines which are being temporarily installed at Grand Coulee will raise the capacity of the station to 494,000 kW in November. Three more 108,000-kW machines, units L-4, L-5 and L-6, are scheduled for completion in 1943, and three further units are due to go into service in 1944 and 1945.

TRANSPORT

Darlington. — NEW TROLLEY-BUSES. — The Ministry of War Transport has allocated eight new trolley-buses to the Town Council for delivery during the year ending March 31st, 1943. The chassis are to be built by Karrier Motors, Ltd., and the bodies by Brush Coachwork, Ltd.

The borough engineer has been instructed by the Town Council to provide turning points for trolley-buses in Bondgate, Coniscliffe Road, Woodburn Drive and Cumberland Street.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Tilling & Automobile Traction, Ltd.—At an extraordinary general meeting held on September 17th, the proposals for the formation of two companies—B.E.T. Omnibus Services, Ltd., and Tilling Motor Services, Ltd.—and the allocation of the company's business between them were approved.

The chairman (Sir Robert Heaton) said that the two controlling companies, the British Electric Traction Co. and Tillings, each of whom would hold more than 94 per cent. of the whole of the share capital in one or other of the new companies, were each content to take the whole of their interest in one only of the companies. In the allocation approximate equality had been provided for so that any new factor which might arise would affect both companies in a similar manner. The interests of the preference shareholders were fully safeguarded by the payment of a fixed 10 per cent. preferential dividend.

Before the company went into voluntary liquidation at a meeting to be held on September 28th, dividends at the rate of 10 per cent. per annum on the preference shares (fixed and participating) and of 3½ per cent., free of tax, on the ordinary shares would be paid in respect of the half-year to June 30th last. The fixed preference dividend at the rate of 8 per cent. per annum had already been paid.

The Atlas Electric and General Trust, Ltd., reports that revenue for the year ended March 31st last amounted to £283,904, compared with £281,874 in the previous year. U.K. taxation required £125,972 (against £108,306) and after providing for debenture interest and expenses there was a net revenue of £118,677 (£133,949), to which is added £147,394 (£125,226) brought in. After payment of the preference dividend there is a balance of £155,165 to be carried forward. The last ordinary dividend was 1 per cent. for 1931-32. The operations of the Uruguayan subsidiary, Sociedad Comercial de Montevideo, resulted in a loss, before providing for depreciation and renewals, of $98,299 (against $235,868), increasing the debt carried forward to $1,449,569 Uruguayan currency. No provision for this loss is made in the accounts of the Trust. The reserve accounts and carry-forward amount to £2,364,117.

In a circular accompanying the accounts reference is made by the chairman to a notice by a shareholder, Mr. J. Emlyn-Jones, of resolutions proposing, *inter alia*, that the board should be strengthened by replacing two of the directors by two others with sound experience and a good knowledge of Spanish. The chairman sets out a number of reasons for the position of the Uruguayan subsidiary in refutation of the suggestion that the directors were responsible. Meeting September 29th.

The United River Plate Telephone Co., Ltd., records a gross revenue for 1941 of £4,298,563 compared with £4,168,303 for 1940, and working expenses of £3,097,180, compared with £2,973,316. Besides interest charges, deductions include exchange adjustment, £6,051 (against £24,966) and preferential share redemption instalment, £30,679 (£29,155), and £169,486 (£170,900) is added for realised appraisal increment. The final ordinary dividend of 3 per cent. makes 6 per cent. for the year (same) and £2,502,173 is carried forward.

The Victoria Falls & Transvaal Power Co., Ltd., held its annual meeting on September 15th. Mr. A. E. Hadley, the chairman, presented the accounts and a statement which had been issued with them was taken as read. The statement showed that in spite of larger earnings from power sales and lower depreciation charges the net profit had declined. This was attributed to a large increase in taxation and consumers' rebate.

The manufacture and shipment of materials for the existing and new power stations and for the transmission system continued as well as conditions permitted; there had recently been indications that manufacture was likely to proceed at a better rate although shipping remained a matter of some difficulty.

The Compania Hispano - Americana de Electricidad ("Chade") reports net profits of 24,069,093 gold pesetas for 1941–42, against 28,822,119 pesetas in the preceding year when profits from the Société d'Electricité (now dissolved) were included. The dividends are at the same rate as last year, *viz.*, 60 paper pesos on the "A," "B" and "C" shares and 12 paper pesos on the "D" and "E" shares. Dividends will be paid in "*bonos de caja*" repayable over a period of eighteen years commencing January 1st next.

Stothert & Pitt, Ltd., announce the payment of a dividend of 10 per cent. plus a bonus of 2½ per cent. for the past year, as for 1940-41.

The Singapore Traction Co., Ltd., has decided not to pay a dividend for the past year on the 7 per cent. preference stock.

Trafford Park Estates, Ltd., is maintaining its dividend at 7 per cent. by a final distribution of 4½ per cent.

The British Aluminium Co., Ltd., is maintaining its interim ordinary dividend at 3 per cent., less tax.

The Midland Counties Electric Supply Co., Ltd., has announced an interim ordinary dividend of 2½ per cent. (unchanged).

The Scottish Power Co. is again paying an interim dividend of 2½ per cent.

Hopkinsons Ltd., have again declared an interim dividend of 5 per cent.

New Companies

Metalux (Electric), Ltd.—Private company. Registered August 15th. Capital, £1,000. Objects: To carry on the business of metal spinners, turners, perforators, polishers and platers, sheet metal workers, electrical and general engineers, electricians, manufacturers of, and dealers in, electric fires, stoves, cookers,

STARTERS

A full range is available, including all types, for A.C. and D.C. Motors, Hand Operated, Automatic, Air, and Oil Break.

SWITCHBOARDS

Of all types, Open Flat Back Type, Enclosed, Oil Immersed Non-Drawout type, and Switchboard mounting gear.

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He doesn't know, but this is the reason

The Heart of a Heater is in the Refractory. However good the main construction of an electric fire or heating apparatus, it counts for nothing if the refractory does not give efficient service.

That is why it pays manufacturers to select this component of their product with extreme care and why so many specify S.P. refractories.

Standard or special designs for all purposes and conditions of service can be supplied promptly. Samples will be sent on request, and the advice of our Technical Service Department is freely offered to all manufacturers.

STEATITE & PORCELAIN PRODUCTS LTD

Head Office: Stourport-on-Severn, Worcs. Phone: Stourport 111. Grams: Steatain, Stourport

SP4

reflectors, cleaners, irons, bells, fans, control gear, dynamos, motors, armatures and domestic appliances, sign manufacturers, fixers and dealers, publicity specialists, etc. Directors : E. J. Bushe, 2, Hughenden Road, Worcester Park, Surrey ; Maud E. Keenan, 5, Claremont Close, Islington, N.1 ; and P. L. Pervinkler, 10, Richards Avenue, Stoneleigh, Surrey. Registered office : 39, Cheapside, E.C.2.

Applied Radiation, Ltd.—Private company. Registered August 25th. Capital, £2,500. Objects : To carry on the business of manufacturers, fitters, maintainers, repairers, merchants and factors of, and dealers in, electrical and mechanical equipment, appliances and accessories, electrical, motor, mechanical and general engineers, etc. Subscribers : G. B. L. Sutton, 1, Moor Park Drive, Bradford and W. G. Withers, 46, Rooley Crescent, Odsal, Bradford. Solicitors : A. V. Hammond & Co., Bradford.

A. Seage, Ltd.—Private company. Registered September 3rd. Capital, £100. Objects: To carry on the business of manufacturing electrical engineers, founders, smiths, machinists, etc. Directors: A. Seage, 32, Ravenscourt Gardens, W.6, and D. A. E. Seage, 18, Ravenscourt Gardens, W.6. Registered office: Arch 145-146, Stamford Brook, W.6.

Starelcarb, Ltd.—Private company. Registered September 4th. Capital, £500. Objects: To acquire the business of manufacturers of, and dealers in, electrical and other components carried on by Star Electro Carbons, Ltd., at 49, Cleveland Road, London, E.18, and elsewhere, and to carry on the business of manufacturers of, and dealers in, carbon brushes, graphite brushes, copper carbon brushes, slip-ring carbons, etc. Directors: C. L. Argent and Mrs. Marjorie E. Argent, both of 20, Albion Hill, Loughton, Essex, D. Fisher, 34, Empress Avenue, Woodford, Essex, S. Hoare, 49, Cleveland Road, London, E.18, and A. G. Izatt, 33, Knighton Road, London, E.7. Registered office: 20, Albion Hill, Loughton, Essex.

Radelec, Ltd.—Private company. Registered August 27th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in wireless apparatus, electrical accumulators and batteries, cabinets, loud speakers, etc. Directors: C. P. Robinson and Mrs. L. Robinson, both of Stansted, Oakland Avenue, Cheltenham. Solicitors: Ivens Thompson & Green, 3, Clarence Parade, Cheltenham.

Payne's Plastic Products, Ltd.—Private company. Registered September 3rd. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, goods made from plastic substances, bakelite, ebonite, vulcanite, amber, ivory, ivorine, erinoid, celluloid, rubber and rubber substitutes, etc. Subscribers: P. P. Payne, 35, Mapperley Road, Nottingham, and J. E. Payne, 78, Wensley Road, Woodthorpe, Nottingham. Secretary: F. S. Bentley.

Radio Neon, Ltd.—Private company. Registered September 10th. Capital, £100. Objects: To acquire from C. S. Thomson an invention relating to electrically energised luminous gas devices, and to carry on the business of manufacturers of and dealers in radio transmitters and receivers, electrical and other lamps, neon tubing and electrical goods, etc. Directors: C. P. Callow, 117, Great Portland Street, W.1., and K. R. R. Readhead, Grand Buildings, Trafalgar Square, W.C.2. Solicitors: Merriman, White & Co., 3, King's Bench Walk, E.C.4.

H. Saunders (Electrical Contractors), Ltd.—Private company. Registered September 11th. Capital, £1,000. Objects: To carry on the business of electrical contractors, electrical engineers, wiring specialists, etc. Directors: H. T. Saunders (permanent governing director) and Mrs. V. H. Saunders, both of "Warbens," Whitwell Road, Ventnor, I.O.W. Secretary: F. R. Hopkins.

Companies' Returns

Statements of Capital

North Eastern Electric Supply Co., Ltd.—Capital, £8,760,000 in £1 shares (1,500,000 7 per cent. cumulative preference, 2,500,000 5 per cent. preference and 4,760,000 ordinary). Return dated April 8th (filed May 12th). 1,500,000 7 per cent. cumulative preference, 1,669,640 5 per cent. preference and 4,759,919 ordinary shares taken up. £6,806,700 paid. £1,062,859 considered as paid. Mortgages and charges : £5,759,437.

Burgess Hill Electricity, Ltd.—Capital, £65,000 in ordinary shares of £1 each. Return dated May 12th. 52,250 shares taken up. £50,400 paid. £1,850 considered as paid. Mortgages and charges : Nil.

Thermalux Electrical Products, Ltd.—Capital, £500 in 500 shares of £1 each. Return dated June 5th. All shares taken up. £500 paid. Mortgages and charges : £750.

Sphere Electric Instruments Co., Ltd.—Capital, £1,000 in 1,000 shares of £1 each. Return dated May 6th. All shares taken up. £1,000 paid. Mortgages and charges : Nil.

Mortgages and Charges

Universal Electric Time & Telephone Systems, Ltd.—Mortgage on freehold land and premises at Erskine Street, Liverpool, dated September 7th, 1942, to secure all moneys due or to become due from the company to Martins Bank, Ltd.

Radiovisor Parent, Ltd.—Mortgage on certain sums of money due under contracts, dated August 27th, to secure £500 and further advances (if any). Holder: Baron Doverdale, Westwood Park, Droitwich.

Flinders (Wholesale), Ltd.—Satisfaction to the extent of £1,000 on August 31st, 1942, of series of first debentures secured by a trust deed dated August 18th, 1932, and registered August 19th, 1932, securing £15,000.

Bankruptcies

H. A. Smith, electrical engineer and contractor and neon sign engineer, 76, Canterbury Street, Gillingham.—Order made August 19th, suspending discharge for one month. Discharged as from September 19th, 1942.

W. R. Marchant, electrical contractor, 81, Sandgate Road, Folkestone.—Trustee, Mr. W. Hillman, Bank Chambers, Ashford, Kent, released August 13th, 1942.

STOCKS AND SHARES

TUESDAY EVENING.

THE general disposition of Stock Exchange markets is to await, for the time being, the issue of definite news from the war zones. It cannot be said that the effect of the news is very pronounced so far as prices are concerned. Where it does make a difference is in the volume of business which goes on day by day. When uncertainty clouds the outlook orders fall away ; when there seems to be a fresh gleam of better news for the Allies activity immediately expands. Prices on the whole hold their ground with firmness. Cable and Wireless stocks have been an outstanding feature of strength.

New Central Board Stock

The £2,000,000 of 3 per cent. Central Electricity (Civil Defence) redeemable stock which was privately placed at 97½, has become marketable to a limited extent, the price being nominally 97 to 99. The actual dealing price is more like 98¼ to 98¾. The Board has placed its stock on very cheap terms. In the ordinary way, there would most probably have been a public issue, with underwriting commission, brokerage to stockbrokers, bankers and others, plus charges for advertising, etc. In respect of the present issue, the Stock Exchange brokers to the Board received a fee of ⅛ per cent. ; that is, £2,500, and, so far as is known, this is the total cost of the issue. It became known in the market that in respect, at any rate, of some of the allotments, the subscribers had agreed not to part from the stock for at least six months. A certain amount of stock became available, however, for dealing purposes, and it is this which is quoted, as mentioned above, at 98½ middle.

Price Fluctuations

Application of investment money to Cable and Wireless ordinary stock has lifted the price to 66—a gain of 4 points on the week. The 5½ per cent. preference at 104½ is 1 up. Optimism hopes for an increase in the dividend on the ordinary stock. Globe Telegraph and Trust ordinary at 28s. have risen a few pence in sympathy with the rise in Cable and Wireless. Anglo-Portuguese Telephones improved to 19s.

Southern Railway preferred stock at 68½ is 10s. up : Transport "C" shows no change at 48.

Amongst Home electricity shares the tendency is for prices to be a little easier. Richmonds at 23s. 9d. have fallen 1/16 and Isle of Thanet at 11s. are slightly easier. Midland Counties at 38s. have lost 9d. and Midland Electric Power 6d. at 41s. 6d. Both companies have declared the same interim dividends as those of a year ago. Some little demand for Metropolitan Electric ordinary raised the price to 35s. 6d. Southern Areas at a guinea show 1s. rise. Amongst the northern companies' shares, Yorkshire Electrics at 39s. 6d. are 6d. down.

Equipment and Manufacturing

Changes amongst equipment and manufacturing shares are mainly upwards. Johnson and Phillips are a good spot at 61s. 3d. Crabtrees put on 6d. to 33s. and British Vacuum Cleaner at 17s. show a similar gain. General Electric ordinary at 81s. have added a shilling. Of the company's 7½ per cent. preference shares, there are 10,000 on offer at 36s. 9d. giving a return of £4 1s. 6d. per cent. The 6½ per cent. preference "A" shares at 33s. 9d. return £3 17s. The latter are, of course, the better security of the two but the "B" shares are sufficiently well protected by the company's earnings to render the shares an excellent investment. Ferranti preference eased off to 27s. and Tube Investments to 87s. Ever Ready at 33s. 6d. are 3d. better. Aron Electrics advanced to 27s. Consolidated Signals at 73s. 9d. at which price the shares have been changing hands, are 3s. 9d. higher, and Chloride Electrical Storage, at the same price, are 1/6 to the good. Pye deferred moved up to 18s. 6d. upon repetition of the previous dividend of 25 per cent.

Enemy Occupation

The Perak River Hydro-Electric Co. announces that no further dividends will be paid on the 5 per cent. cumulative preference shares until the properties are restored. Last year, the ordinary shares received 7 per cent., an improvement of 1 per cent. upon the results of the previous year. It was obvious enough that, with the Japanese occupation of Malaya, no dividend could be expected on the company's shares and the announcement occasioned no particular surprise. The price of the ordinary shares is lower at 6s. and the preference shares, also of £1 each, have gone back to 7s. 6d.

Tilling and B.A.

In the reorganisation of Tilling and British Automobile Traction the effect will be, as already announced, to divide the Thomas Tilling road transport interests from those of the British Electric Traction Co. Tilling and B.A. Traction is to be wound up and in its place there will appear two new companies, Tilling Motor Services, Ltd., and B.E.T. Omnibus Services, Ltd. Tilling Motor Services will have a nominal capital of £2,000,000 and will include in its assets the capitals of nearly forty companies which operate in various parts of the country, from

(*Continued on page* 412)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Sept. 22	Rise or Fall	Yield £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	50/-		5 0 0
British Power and Light	6	6	26/-		4 12 4
City of London	7	7	26/3		5 6 8
Clyde Valley	8	8	40/-		4 0 0
County of London	8	8	35/-		4 11 6
Edmundson's:					
7% Pref.	7	7	33/9		4 3 0
Ord.	6	6	28/-		4 5 9
Elec. Dis. Yorkshire	9	9	42/-		4 5 9
Elec. Fin. and Securities	12½	12½	48/9		5 2 6
Elec. Supply Corporation	10	10	46/6	−6d.	4 10 0
Isle of Thanet	2	Nil	11/-	−3d.	—
Lancs. Light and Power	7½	7½	33/-		4 11 0
Llanelly Elec.	5½	5½	22/6		4 17 9
Lond. Assoc. Electric	4½	4	18/6	−3d.	4 6 6
London Electric	6	6	23/9		—
London Power Red. Deb.	5	5	104½		4 15 7
Metropolitan E.S.	8	8	35/6	+6d.	4 10 2
Midland Counties	8	8	38/-	−9d.	4 4 3
Mid. Elec. Power	9	9	41/6	−6d.	4 6 9
Newcastle Elec.	7	7	30/-		4 13 5
North Eastern Elec. Ordinary	7	7	30/6xd	−6d.	4 11 10
7% Pref.	7	7	33/6		4 3 7
Northampton	10	10	46/-	−3d.	4 7 0
Notting Hill 6% Pref. (£10)	6	6	9		—
Northmet Power:					
Ordinary	7	7	32/6		4 6 2
6% Pref.	6	6	30/6		3 18 8
Richmond Elec.	6	6	23/9	−⅛	—
Scottish Power	8	8	38/3		4 3 9
Southern Areas	5	5	21/-	+1/-	4 15 3
South London	7	7	25/-		—
West Devon	5	5	22/6		4 9 0
West Glos.	4½	3½	20/-		3 10 0
Yorkshire Elec.	8	8	39/6	−6d.	4 1 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/6		—
Calcutta Elec.	7*	7*	26/-	+3d.	5 7 9
Cawnpore Elec.	10	10	25/-		8 0 0
East African Power	7	7	27/-		5 3 8
Jerusalem Elec.	7	5	17/6		5 14 4
Kalgoorlie (10/-)	7½	5	7/6		6 13 4
Madras Elec.	6*	4*	18/9		4 5 4
Montreal Power	1½	1½	24		6 5 0
Palestine Elec. "A"	Nil	4*	21/6	+3d.	3 14 3
Perak Hydro-elec.	6	7	6/-	−1/6	—
Shawinigan Power	83cts.	90cts.	15½		—
Tokyo Elec. 6%	6	6	14½	+1	—
Victoria Falls Power	15	15	75/-	+⅛	4 0 0
Whitehall Inv. Pref.	5	5	15/9		6 7 0

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Sept. 22	Rise or Fall	Yield £ s. d.
Public Boards					
Central Electricity:					
1950-70	5	5	109		4 11 9
1955-75	5	5	114		4 7 9
1951-73	4½	4½	107½		4 3 9
1963-93	3½	3½	103½		3 7 8
1974-94	3½	3½	99½		3 5 4
London Elec. Trans. Ltd.	2½	2½	96		2 12 1
London & Home Counties 1955-75	4½	4½	109		4 2 7
Lond. Pass. Trans.:					
A	4½	4½	115½		3 18 0
B	5	5	114½		4 7 4
C	3	2⅞	48		5 19 10
West Midlands J.E.A. 1948-68	5	5	108		4 12 7
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	110		5 9 1
Def.	1½	1½	26		5 15 5
Anglo-Portuguese	8	8	19/-	+6d.	8 8 6
Cable & Wireless:					
5½ Pref.	5½	5½	104½	+1	5 5 3
Ord.	4	4	66	+4	6 1 3
Canadian Marconi $1	Nil	4cts.	5/-		3 7 0
Globe Tel. & Tel.:					
Ord.	8½*	5*	28/-	+6d.	3 11 5
Pref.	6	6	27/6		4 7 5
Great Northern Tel.: (£10)	Nil	Nil	16		—
Inter. Tel. & Tel.	Nil	Nil	3		—
Marconi-Marine	7½	7½	29/-		5 3 5
Oriental Tel. Ord.	16	10	52/6		3 16 2
Telephone Props.	6	Nil	12/-		—
Tele. Rentals (5/-)	10	10	9/9	+3d.	5 2 7
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	3/-		—
4% Inc.	Nil	Nil	9½		—
Brit. Elec. Traction:					
Def. Ord.	45	45	950		4 14 9
Pref. Ord.	8	8	170		4 14 2
Bristol Trams	8	10	46/3		4 6 6
Brazil Traction	$1	50c	16¾	+½	—
Calcutta Trams	8	5½	18/3		6 0 9
Cape Elec. Trams	5	5	21/-		4 15 3
Lancs Transport	10	10	43/9		4 11 4
Mexican Light:					
1st Bonds	5	5	90		5 11 1
Rio 5% Bonds	5	5	101		4 19 0
Southern Rly.:					
5% Prefd.	5	5	68½	+½	7 6 1
5% Pref.	5	5	105½		4 14 9
T. Tilling	10	10	47/6	+6d.	4 4 3
Tilling & B.A.	7*	6½*	57/6xd		2 5 3
West Riding	10	10	39/6	+6d.	5 1 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Sept. 22	Rise or Fall	Yield £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. ..	Nil	7½	27/–	+1/–	5 11 1
Assoc. Elec. :					
Ord.	10	10	46/3	..	4 6 6
Pref.	8	8	39/–	..	4 2 0
Automatic Tel.& El.	12½	12½	52/6	..	4 15 3
Babcock & Wilcox	11	11	46/6	..	4 15 8
British Aluminium	10	10	45/–	..	4 9 0
British Insul. Ord.	20	20	95/–	..	4 4 3
British Thermostat (5/–)	18½	18½	16/3	..	5 13 10
British Vac. Cleaner (5/–)	12½	10	17/–	+6d.	—
Brush Ord. (5/–)..	Nil	6	6/6	..	4 12 4
Callender's ..	15	15	73/9	..	4 1 4
Chloride Elec. Storage	15	15	73/9	+⅛	4 1 4
Cole, E. K. (5/–)..	Nil	7	14/–	..	2 10 0
Consolidated Signal	17	17	73/9	+⅜	4 12 2
Crabtree (10/–) ..	17½	17½	33/–	+6d.	5 6 1
Crompton Parkinson Ord. (5/–) ..	30	20	21/3	..	4 14 0
E.M.I. (10/–) ..	Nil	6	17/6	..	3 8 7
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	12½	12½	52/6	..	4 15 3
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	41/3	..	4 17 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)	22*	20*	41/3	..	2 8 6
Ever Ready (5/–)	40	40	33/6	+3d.	5 19 5
Falk Stadelmann	7½	7½	23/9	..	6 6 4
Ferranti Pref. ..	7	7	27/–	–6d.	5 3 8
G.E.C. :					
Pref.	6½	6½	33/9	..	3 17 0
Ord.	20	17½	81/–	+1/–	4 6 6
Greenwood & Batley	15	15	32/–	..	9 7 6
Hall Telephone(10/–)	10	12½	20/9	..	6 0 5
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	15	52/6	..	5 14 5
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion..	32½	30	110/–	+½	5 9 0
Johnson & Phillips	15	15	61/3	+⅛	4 17 9
Lancashire Dynamo	20	20	71/3	..	5 12 4
Laurence, Scott(5/–)	15	12½	9/6	..	6 11 7
London Elec. Wire	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	68/9	..	4 7 3
Mather & Platt ..	10	10	41/3	+⅛	4 17 0
Met. Elec. Cable Pref.	5½	5½	21/3	..	5 3 6
Murex	20	20	97/6	..	4 2 0
Pye Deferred (5/–)	25	25	18/6	+3d.	6 15 2
Revo (10/–) ..	20	17½	31/–	+1/–	5 13 0
Reyrolle	12½	12½	60/6	..	4 2 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Smith, S. (1/–) ..	50	37½	7/6	–9d.	5 0 0
Strand Elec. (5/–)	2	4	4/9	+3d.	4 4 3
Switchgear & Cowans (5/–) ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M... ..	10	10	43/9	..	4 11 4
Telephone Mfg.(5/–)	9	9	10/–	..	4 10 0
Thorn Elec. (5/–)..	20	20	16/3	..	6 3 1
Tube Investments	23⅓	20	87/–	–6d.	4 12 0
Vactric (5/–) ..	Nil	Nil	8/6	..	—
Vickers (10/–) ..	10	10	17/3	..	5 16 0
Ward & Goldstone (5/–)	20	20	20/–	..	5 0 0
Westinghouse Brake	10	10	50/–	..	4 0 0
Walsall Conduits(4/–)	55	55	38/9	..	5 13 4
West, Allen (5/–)	7½	7½	5/9	..	6 10 5

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 410)

Wiltshire and Dorset to Cumberland and Scotland. The British Electric Traction Omnibus Services, with a similar capital, will hold interests in about the same number of different companies. Thomas Tilling, the original company, came into being in 1847. From the Stock Exchange market point of view, there is not likely to be any particular increase in business resulting from the division. Expectation looks for a market to be started sometime next month in the new 10s. shares of the two companies.

Telephone Rentals

The 5s. shares of Telephone Rentals, Ltd., are quoted harder at 9s. 9d., showing at that figure a return of 5⅛ per cent. on the money. The chairman at the recent meeting spoke with cautious hopefulness of the prospects of the company during the present financial year, of which eight months have already expired. He said that the results for this period showed no falling off. It may be reasonably assumed that the company will maintain its present 10 per cent. dividend and, in view of the post-war prospects, the shares are regarded as healthy investment in their class.

Telephone shares of all descriptions are popular just now, as will have been observed by the recorded improvements in our price lists during the past few months.

Atlas Electric

Atlas Electric shares hold their recent rise at 4s. 6d. The report and accounts which appeared a few days ago, and which are to be submitted to the meeting on September 29th, show a small increase in earnings. Net revenue has decreased from £173,568 to £157,932. With the report and accounts the chairman, Mr. W. S. Poole takes up the cudgels in reply to criticisms which have been made by Mr. J. E. Emlyn-Jones, a shareholder, who is to propose resolutions at the meeting which, if passed, will make a radical alteration in the direction of the Trust. The criticisms, and their reply, are too lengthy for repetition here, but shareholders who attend the meeting would seem to be assured of hearing a lively discussion.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1940

16744. "Storage batteries." Koehler Manufacturing Co. December 15th, 1939. (547365.)

16981. "Dry cells." Burgess Battery Co. December 13th, 1939. (547400.)

18075. "Control systems for automatically controlling the control surface of a craft." Sperry Gyroscope Co., Ltd., R. H. Nisbet and W. G. Harding. December 23rd, 1940. (547484.)

1941

701. "Power plants for aircraft." Bristol Aeroplane Co., Ltd., A. H. R. Fedden, F. M. Owner, F. M. Thomas and S. W. Mansell. January 17th, 1941. (547403.)

2277. "Signal collecting systems for radio receivers and the like." Johnson Laboratories, Inc. February 19th, 1940. (547367.)

2463. "Electric insulators." A. Reyrolle & Co., Ltd., and I. W. A. Kirkwood. February 24th, 1941. (547410.)

2503. "Remote control systems, *e.g.*, for landing lamps of aircraft and the like." M. C. Harley. February 24th, 1941. (547412.)

2536. "Tubulous boilers." Babcock & Wilcox, Ltd. July 30th, 1940. (Addition to 526825.) (547413.)

2537. "Tubulous boilers." Babcock & Wilcox, Ltd. July 18th, 1940. (547414.)

2632. "Air heating and cooling apparatus." International Anemostat Holding Co., Ltd. February 29th, 1940. (547436.)

2676. "Static screened connectors for electrical circuits." Bendix Aviation Corporation. March 22nd, 1940. (547460.)

2678. "Electric cables." W. T. Henley's Telegraph Works Co., Ltd., and W. W. Watkins. February 27th, 1941. (547461.)

2695. "Cathode-ray tubes." J. L. Baird. February 27th, 1941. (547441.)

2716. "Tuning inductances." Marconi's Wireless Telegraph Co., Ltd. February 29th, 1940. (547492.)

2747/8. "Drilling machine attachments." Standard Telephones & Cables, Ltd., W. Sellors and G. W. Searle. February 28th, 1941. (547496/7.)

2749. "Short- and ultra-short-wave oscillators." Standard Telephones & Cables, Ltd., and E. O. Willoughby. February 28th, 1941. (547498.)

2750. "Multiple frequency oscillation generators." Standard Telephones & Cables, Ltd., and B. B. Jacobsen. February 28th, 1941. (547499.)

2927. "Liquid dielectric compositions." British Thomson-Houston Co., Ltd. March 6th, 1940. (547444.)

3109. "Production of artificial speech." Standard Telephones & Cables, Ltd. March 16th, 1940. (547505.)

4510. "Alternating-current signalling systems." Standard Telephones & Cables, Ltd. April 5th, 1940. (547468.)

4798. "Electric cables." Callender's Cable & Construction Co., Ltd., and P. V. Hunter. April 10th, 1941. (547470.)

4848. "Telephone switch." Standard Telephones & Cables, Ltd. April 12th, 1940. (547368.)

5016. "Edison-screw lamp extractor and replacer." E. Leigh and E. Rotherham. April 17th, 1941. (547369.)

6428. "Manufacture of electric resistances." J. A. Henley and Metropolitan-Vickers Electrical Co., Ltd. May 19th, 1941. (547449.)

6475. "Apparatus for the prevention of ice formation on aeroplane propellers." British Thomson-Houston Co., Ltd., and L. J. Clark. May 20th, 1941. (547371.)

6633. "Vapour electric devices." Westinghouse Electric International Co. July 12th, 1940. (547509.)

6740. "Prepayment mechanism." Measurement, Ltd., and C. F. Clifford. May 26th, 1941. (547472.)

7141. "Radio relay systems." Marconi's Wireless Telegraph Co., Ltd. June 5th, 1940. (547510.)

7477. "Gas producers." Birmingham Electric Furnaces, Ltd., and P. F. Hancock. June 13th, 1941. (547454.)

7652. "Detectors for frequency modulated radio-frequency energy." Marconi's Wireless Telegraph Co., Ltd. June 18th, 1940. (547473.)

7937. "Electric switches of the quick-make-and-break and pull-push type." Rotax, Ltd., and W. G. Bourne. June 24th, 1941. (547512.)

9436. "Electric circuit interrupting devices." British Thomson-Houston Co., Ltd. July 25th, 1940. (547377.)

9463. "Electric switches with rubbing contacts." Chance Bros. & Co., Ltd., and L. B. H. Hallett. July 25th, 1941. (547475.)

11298. "Electric fuse-holders." Dorman & Smith, Ltd., T. Atherton, and J. Lund. September 4th, 1941. (547425.)

13901. "Electrical systems of remote indication." General Electric Co., Ltd., and R. W. G. Field. October 29th, 1941. (547384.)

14691. "Power plants for aircraft." Bristol Aeroplane Co., Ltd., A. H. R. Fedden, F. M. Owner, F. M. Thomas and S. W. Mansell. January 17th, 1941. (Divided out of 547403.) (547426.)

16282. "Gas-blast electric circuit-breakers." British Thomson-Houston Co., Ltd. December 19th, 1940. (547388.)

16520. "Electrical resistors." United Air Lines Transport Corporation. May 10th, 1940. (Divided out of 545007.) (547481.)

1942

3581. "Temperature control devices for refrigerators." British Thomson-Houston Co., Ltd. March 20th, 1941. (547393.)

3622. "Vibratory switches." A. H. Stevens. (Electronic Laboratories, Inc.). March 18th, 1942. (547394.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Orders Placed

Bedford. — Watch Committee. Accepted. Loudspeaker apparatus for police car (£34).—Birmingham Sound Producers, Ltd,

Glasgow. — Electricity Committee. Accepted. Eight 800-kVA transformers (£4,860).—Bruce Peebles & Co. Four 800-kVA transformers (£2,430).—British Electric Transformer Co.

London. — LEWISHAM. Emergency Committee. Recommended. Electrical installation at Shroffold Road nursery (£86).—J. H. Plant, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bradford.—Two nurseries; city architect.

Bury.—Alterations to premises for National Fire Service; J. Chadwick, borough engineer, Municipal Offices, Bank Street.

Caernarvon. — Social centre; secretary, Y.W.C.A., Claremont, Marine Road, Colwyn Bay.

Canterbury.—Temporary school accommodation, Wincheap Council School (£2,000); city engineer.

Carlisle.—Further wartime nurseries; P. Dalton, city engineer.

Chesterfield.—Radium clinic for Chesterfield and North Derbyshire Royal Hospital; T. Pearson, J.P., chairman of Hospital Board.

Chippenham.—Adaptation of Old Palace for use as Council Offices; borough surveyor.

Cornhill-on-Tweed.—Hostel; R. Carse & Sons, High Street, Amble, Northumberland.

Coseley.—Wartime nursery; A. M. Griffiths & Son, Ltd., building contractors, Thomas Street, Wolverhampton.

Coventry.—Extensions to Moseley Avenue Council School; D. E. E. Gibson, city architect, 1A, Warwick Row.

Devon.—Extension to Hawkmoor Sanatorium for Public Health Committee; county architect, Heavitree Road, Exeter.

Dewsbury.—School canteen, Lower Whitley Chapel; M. H. Forward, borough architect, Town Hall.

Dorchester.—Enlargement of fire station and report centre; borough engineer.

Durham.—British Restaurant, Front Street, Framwellgate Moor; S. Dodds, R.D.C. surveyor.

Eastham.—Church, Heygarth Road, for Building Committee; secretary, Presbyterian Church Extension Committee, Liverpool.

Glasgow.—Completion of houses; architect, Housing Department.

Hertfordshire.—Nursery school, Bowling Road, Ware; Clerk's Department, Castle Street, Hertford.

Hetton-le-Hole.—Completion of partly built houses; C. Butterworth, surveyor, U.D.C. Offices, Hetton-le-Hole, Durham.

Hexham.—British Restaurant; U.D.C. surveyor.

Isle of Ely.—Dinner kitchen at Wisbech High School; R. D. Robson, county architect, County Hall, March.

Leigh.—Canteen extensions; secretary, Lilford Weaving Co., Etherstone Mills.

Manchester.—Brickworks, Cheetham; W. Higgins & Son (Manchester), Ltd., Broughton Street, Cheetham.

Works alterations and additions, Hulme; A. McDonald, architect, 637, Mauldeth Road West, Chorlton-cum-Hardy.

Offices and mess room, Grosvenor Garage, Levenshulme; A. Freeman, motor engineer, Burnage Lane, Levenshulme, Manchester, 19.

Oldham.—British Restaurant; G. E. Hardy, borough surveyor, Municipal Offices, 75, Union Street.

Oxford.—Fire station, etc. (£1,873); borough engineer, Municipal Buildings.

Pelaw.—Air-raid shelters and protective works; C.W.S. Building Department, West Blandford Street, Newcastle-on-Tyne.

Ponteland.—Cooking depot for schools; R. G. Williamson, Strathmore Road, Rowlands Gill, Co. Durham.

Poole.—Adaptation of wards at Alderney Hospital as cubicle ward block (£2,400); J. R. Barron, borough engineer, Municipal Buildings, Park Gates East, Poole.

Richmond (Surrey).—Conversion of Carrington Lodge, Sheen Road, for use as British Restaurant; Borough Engineer's Office, Hotham House, Heron Court, Richmond, Surrey.

Stockport.—Rebuilding Admiral Hotel, Middle Hillgate; Architects' Department, Walker & Homfray, Ltd., Woodside Brewery, Eccles New Road, Salford, 5.

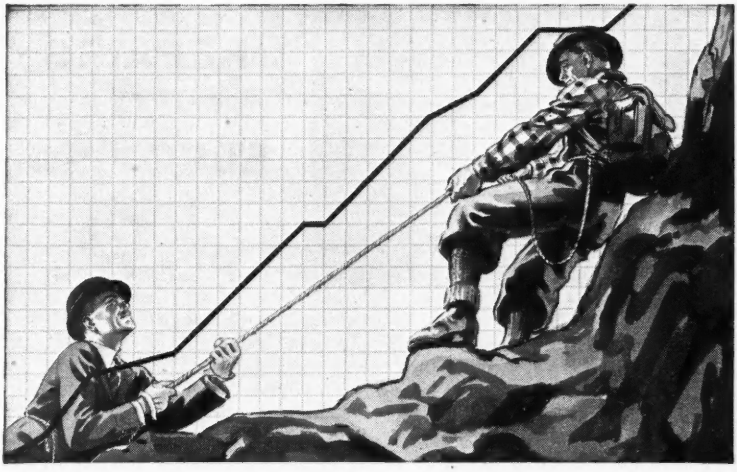
Swinton and Pendlebury.—Installation of an electric pumping set at sewage works; A. Cordwell, borough engineer, Town Hall, Chorley Road, Swinton, Lancs.

Tynemouth.—Extension of emergency feeding facilities and restaurant; borough engineer, 19, Howard Street, North Shields.

Wellingborough.—British Restaurant, Church Street; R. Kilby, surveyor, Council Offices, Swanspool, Wellingborough.

West Lancashire.—Buildings, Maghull, for U.D.C.; R. Rosbotham, surveyor, Council Offices, Ormskirk, near Liverpool.

Wood Green.—Erection of huts, garages, shelter, etc., to form new fire station; R. Harrison, borough engineer, Town Hall, Wood Green, N.22.



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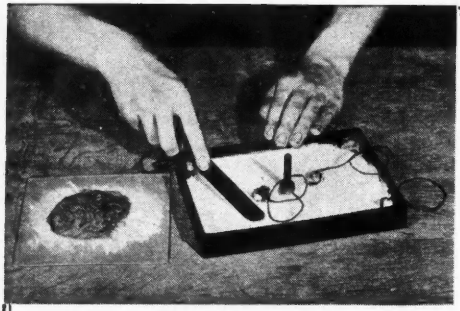

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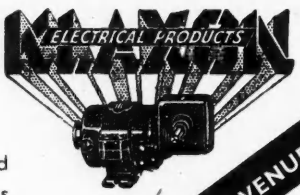

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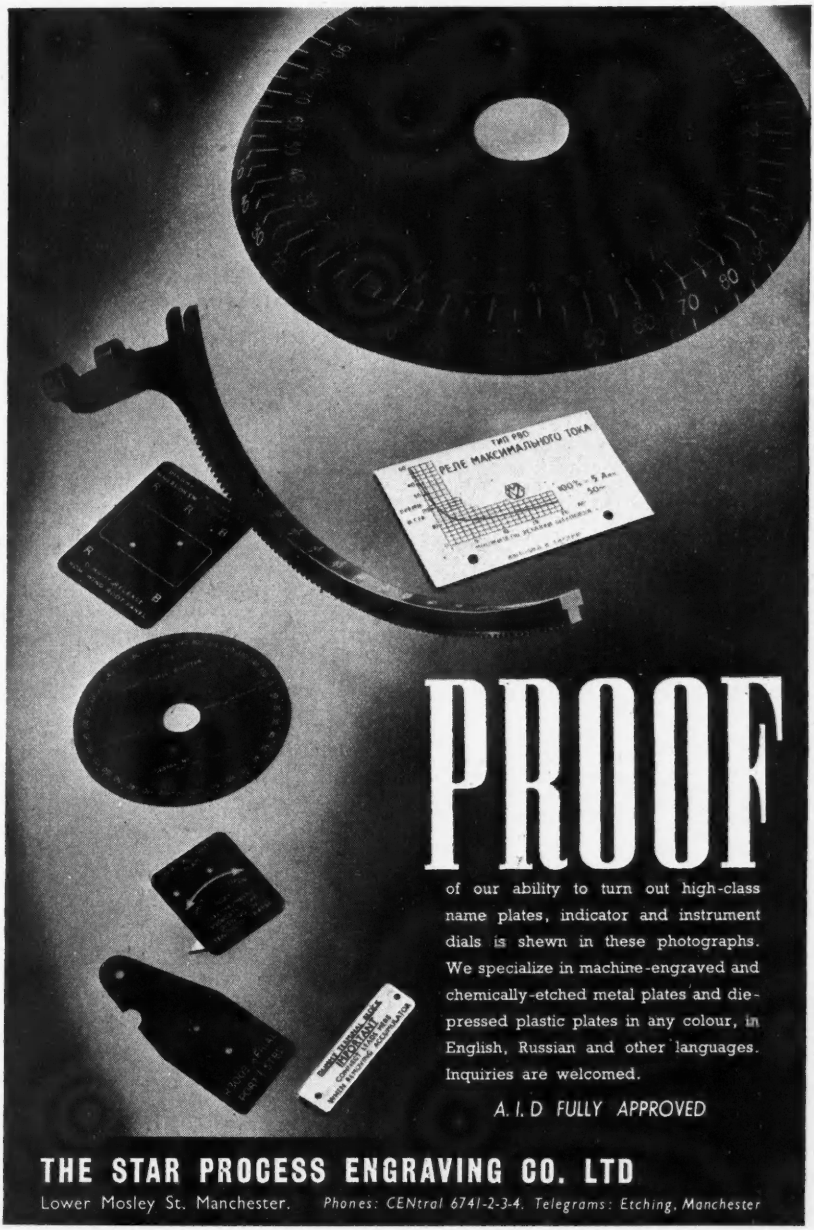

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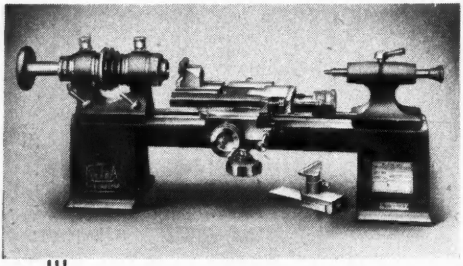

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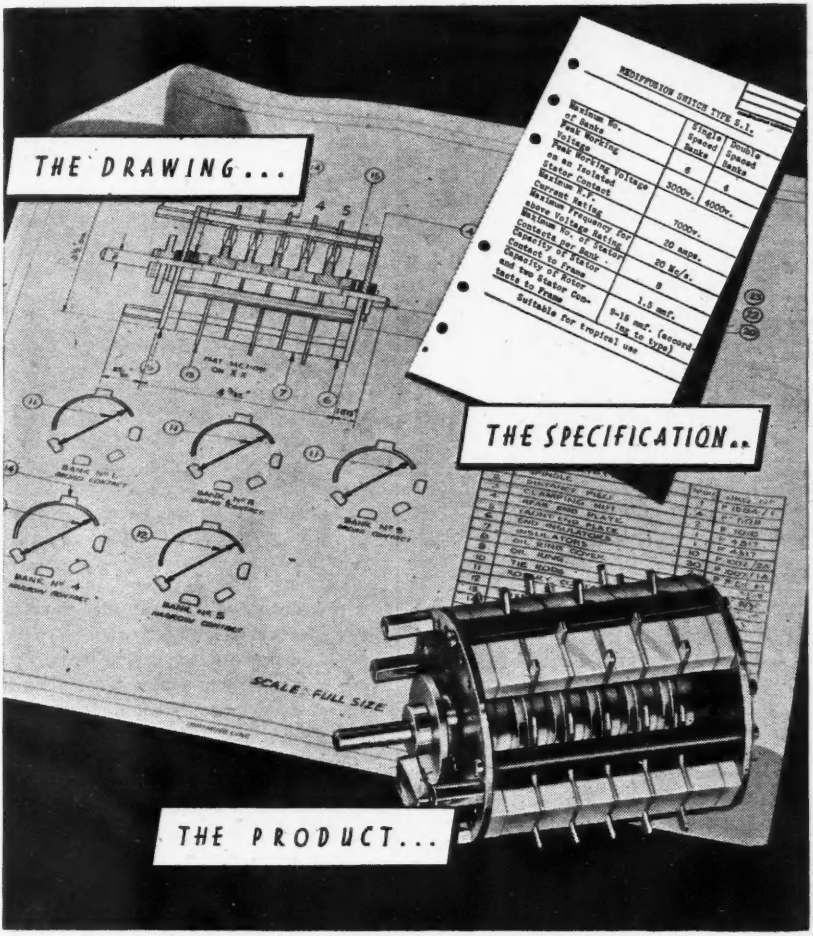

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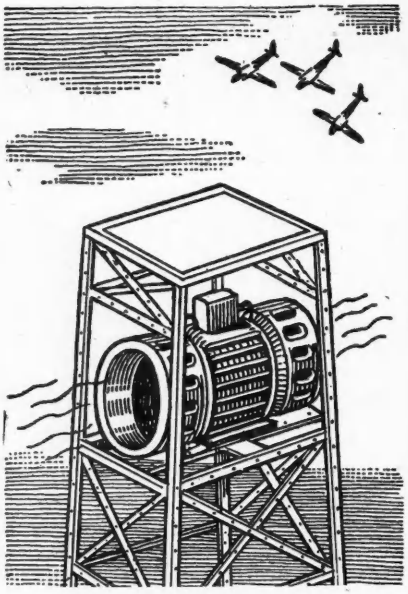

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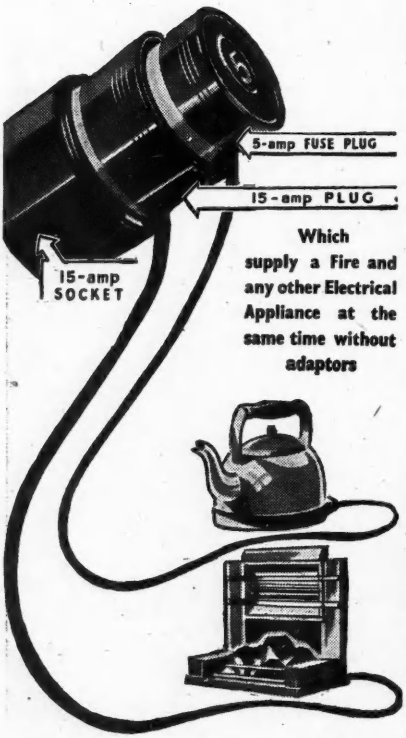

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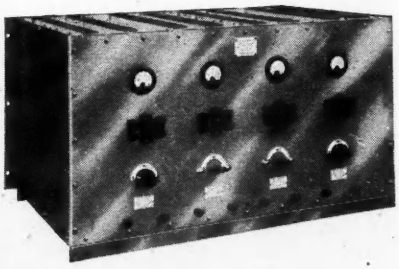

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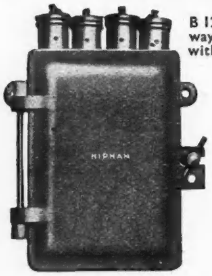

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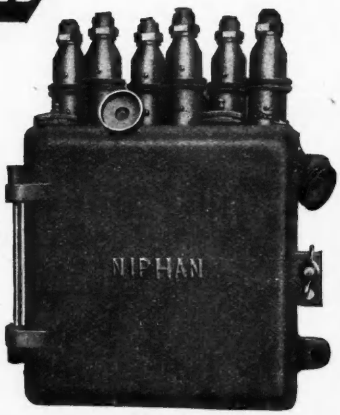

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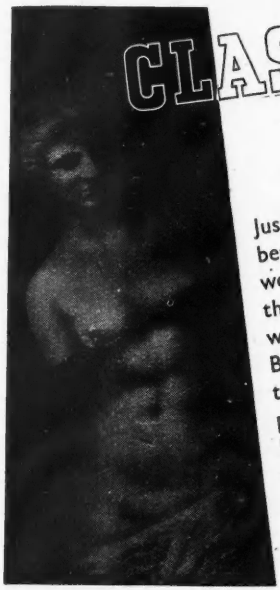

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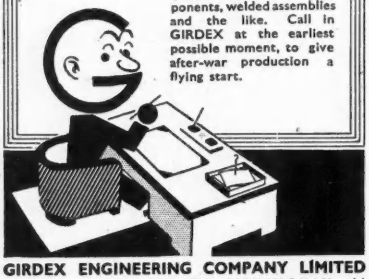

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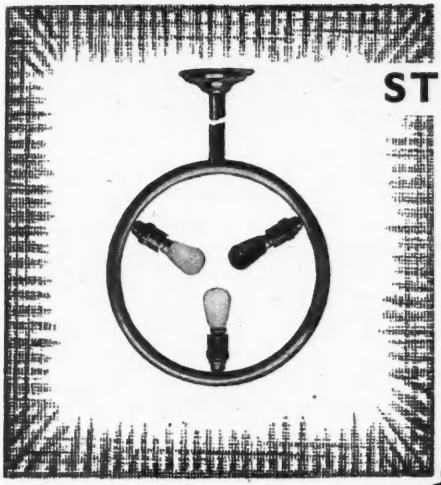

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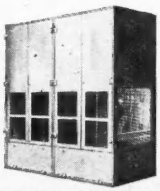

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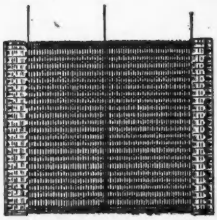

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